

THE MONIST

ON THE MONISM OF PROFESSOR MACH.¹

A CONSPICUOUS effort at realizing a monistic conception of life and the world has been put forward by a succession of thinkers, those who are interested in philosophical considerations as well as in natural science and nature-philosophy. The way in which the effort was made has differed greatly, however, in each case. We need think only of such names as Spinoza, Berkeley, Haeckel, and Ostwald. But perhaps even these have something in common with each other if we contrast their conceptions with Mach's scientific point of view.

Time and again, and even in his latest work,² Mach proclaims with especial emphasis his naturalistic standpoint in contrast to the philosophical. And it really seems to me as if in this circumstance lies one of the most noticeable differences between Mach's standpoint and that of any exponent of philosophy or natural philosophy, including also the Editor of this periodical.

Professor Mach congratulates the philosopher upon finding himself "in the fortunate position of possessing unshakable principles," while on his side he is satisfied as a naturalist "to consider even his surest and best-founded views and principles as provisional."

¹ Translated from Professor Kleinpeter's manuscript by Lydia Gillingham Robinson.

² *Erkenntnis und Irrtum, Skizzen zur Psychologie der Forschung*. Leipzig: Barth, 1905

Under these circumstances the question arises how it can be worth while for the scientist to content himself with so modest a rôle. Is he really at so great a disadvantage in comparison with the philosopher, and is it right that his speculations should rest on so weak a basis?

So many of the systems of world-conceptions with which naturalists have furnished the world seem to confirm this idea. But the well-informed man knows, too, how far removed from this are Mach's ideas and trend of thought. And if we glance over the greatest part of the work of this untiring investigator, it will not be hard to see wherein he discovers the critical point of the conceptions of natural science. Mach's glance is directed constantly not on the incomplete conclusions of natural science in regard to the entirety of the universe, but much more on the *modus operandi*, the method employed by the naturalist, which Mach has endeavored to lay bare by painstaking critical historical research, and which he constantly strives to promote and to free from all impediments, i. e., of a metaphysical nature. Thus his aim has always been to construct a monistic interpretation and at the same time to remove the barriers which separate one department from another. Especially has he endeavored to bring psychology and physics closer together in this way and to find a common ground for them. If we consider that Fechner's *Elements of Psychophysics* was published a few years before Mach came forward with his views (a work which according to Mach's own statement made a powerful impression upon him), then we may be justified in pointing to the impulse emanating from this work as the motive power which chiefly influenced Mach's thought in this direction. That Mach's speculations were crowned with success is perhaps mainly due to his early acquaintance with Kant's train of thought.

For, however the case may be, the fact remains that

Mach searched for a common view-point for both psychical and physical in essential methodological interests and found it soon after the appearance of Fechner's greatest work, and gave it to the world.

Mach's monism is not a monism of system but a monism of method.

Critical observation of the naturalist's activity formed the starting-point of his efforts in the general field of active philosophical work. Probably the first question that he put to himself was, What forms the particular subject of investigations in natural science? It was the answer to this which placed him in opposition to the traditional point of view of almost all physicists and most philosophers. The former had so accustomed themselves to the mechanical conception of all nature that they were hardly in a position to comprehend how any one could assign any other task to physics than the investigation of the distribution of matter and its operative forces, or in a later stage, of matter and energy (Maxwell), or of matter and motion (Kirchhoff). But philosophers had not unlearned the habit of looking with contempt upon the universe of phenomena since the time of the Eleatics; their glance remained rigidly fixed upon the "thing-in-itself." Then came Mach who explained as the object of the naturalist's occupation "sense-perceptions," a name which he chose under compulsion in lieu of a more suitable one, and which he later replaced by "elementis"; for the sense in which he wished to have the word taken deviated to some extent from the customary usage. By the sound of the word we are inclined to put too much emphasis on the perceiving subject. But it was far from Mach's intention to emphasize this connection from only one point of view; on the contrary he saw at the time in sensations the material of the *actual* world. In this his fundamental views are essentially distinguished from those of idealistic philos-

ophy, Berkeley's among others. We may even call them realistic, but their realism indeed is essentially different from so-called philosophical realism. Then there are a number of philosophers, as for instance Stumpf, to whom the physicists are not physical enough, who never tire of declaring that on the other side of the world of phenomena there exists another, the actual world in which the laws of physics become valid, and which forms the end and aim of the physicist. Particularly, since the utterance of Hertz that it was enough for the physicist to possess a picture of the universe whose existence "in-itself" Hertz still clung to, though its investigation "in-itself" he had already recognized as superfluous, most of the physicists learned to be reconciled to Mach's fundamental conception; and it is to some extent amusing when philosophers in the alleged interest of physics designate something as absolutely necessary which the physicists themselves had previously learned to renounce, and prepare to instruct them upon the character of their science in which of course the philosophers themselves are only laymen.

We can say without fear of contradiction that to-day it is no longer seriously questioned that sense-perceptions form the object of the naturalist's research, that its aim is the construction of a legitimate connection between them, and that it is the task of scientific representation to give an abbreviated account of it by a reconstruction in thought.

But on the other hand sense-perceptions form also the object of psychological research. Consequently the substance does not differ in the two domains, but only the line of investigation. Since this, however, changes also within the realm of natural science, the boundary disappears which had existed until now between these two great departments of science, and also the contrast between the psychical and the physical. What we call physical and

psychical is constructed out of but one kind of elements. In the vast numbers of constantly changing elements we notice only certain relations. We find that a definite perception, which we designate perhaps as a table, seems to be always combined with certain tactile and muscular sensations which can be separated in some way; i. e., a definite group of *always* recurring sensations does not exactly appear, but the permanent element continues in a functional dependence in consequence of which still other elements appear joined to it in the case where there is a particular group of sensations. These centers of relation form what are commonly called "bodies," and *one* also of these centers or bodies is the ego.

The renowned Clifford, whose contributions to the theory of cognition have been too little heeded, also expresses this same thought in the following words:³ "My feelings arrange and order themselves in two distinct ways. There is the internal or subjective order, in which sorrow succeeds the hearing of bad news, or the abstraction "dog" symbolizes the perception of many different dogs. And there is the external or objective order, in which the sensation of letting go is followed by the sight of a falling object and the sound of its fall. The objective order, *qua* order, is treated by physical science, which investigates the uniform relations of objects in time and space. Here the word "object" (or *phenomenon*) is taken merely to mean a group of my feelings, which persists as a group in a certain manner; for I am at present considering only the objective order of my feelings. The object, then, is a set of changes *in* my consciousness, and not anything out of it. . . . The inferences of physical science are all inferences of my real or possible feelings; inferences of something actually or potentially in my consciousness, not of anything outside it."

³ *Lectures and Essays*. London, 1901. Vol. 2, page 52.

As far as the ego is particularly concerned Mach points out, especially in his latest work, that the same thought-process which brings us to the concept of our own ego leads also to the concept of the ego of others. In a certain sense we are reminded too of Kant, and his attempt to refute idealism can be so interpreted or re-interpreted as to mean that the same processes lead to the formation of the concept of bodies as of the ego. In this way there has arisen from the original pursuit of a monistic point of view of the work of cognition among naturalists as well as psychologists a kind of philosophical idea which, however, many philosophers comprehend in their own way, i. e., as the foundation of a system. But it is characteristic of any system that it begins with some few self-evident propositions and descends from these to particulars. Mach's method was exactly the reverse and it is easy to understand how it was unavoidable that misunderstandings would arise from such a re-interpretation of his procedure.

But Mach's monistic point of view is not exhausted with the maintenance of the point of departure which has just been characterized; it is exemplified also in the fact that everywhere the ground is broken for a unification of phenomena. It is true that Mach dispelled the dream of a universal mechanical conception of physics, but only in order to gain a broader basis for the conception of the operations of nature as a whole, and, consequently, too, of those in living and animate organisms. His new work *Erkenntniss und Irrtum* is very significant in just this direction. The psychology of investigation is his subject; and what Mach strives in every way possible to set forth, what the treasure of his rich "direct" and "indirect" experiences suggest to him, consists in the fact that the activity of the investigator does not differ essentially from that of the thinker in the ordinary course of life; and that this in

turn is not essentially different from the animal's manner of proceeding; nor this again from the phenomena of inorganic nature. A noble feature of the unification of our world-conception permeates the whole. Here, too, Mach is far from advancing one of the philosopher's own claims to the statement of a perfected truth; on the contrary he says expressly in this place that "the acceptance of a soul that is free and operates without law will always be hard to refute, since experience will always produce an irreducible residuum of facts"; but "the free soul as a *scientific* hypothesis, and even a search for it" is a *methodological* aberration according to his opinion.⁴ Here too we come upon the emphasis of a methodological principle.

And if we scan the great methodological principles which Mach has established we shall find again throughout them the foundation of a monistic manner of thought. Formerly there was a dualism with reference to the conception of the sciences which were distinguished *a priori* and *a posteriori* as sciences of pure thought and of experience. Mach recognizes but one category. In his new work he refers even arithmetic to experience in contrast to a familiar utterance of Gauss. Not only the sources of science, however, are posited as everywhere the same (namely in experience) but also the degree of certainty knows only quantitative distinctions. There is no such thing as knowledge which is absolutely and unconditionally valid. The essence of science is the same everywhere, a means by which we are spared direct experience. Its value lies in this economy and in the possibility arising from it, of enlarging our knowledge. Science has received a new definition, a methodological definition; and the same is true of the principles of comparison, transformation and adaptation. Now if we look back the same fundamental thoughts return to us; the essential thing is doing and not

⁴ *Erkenntniss und Irrtum*, p. 25.

being. The task of science is "the discovery of identity amidst diversity" (Jevons); its aim, the aim of research, must be directed towards a possible unification. Different points of view are possible and useful, but ultimately there must be one from which we can survey the entire field of human activity.

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EGYPTIAN MYTHOLOGY AND THE BIBLE.¹

THE points of contact between Judaism and the religion of Babylonia have frequently been mentioned by numerous writers, but the traces of Egyptian mythology in both Jewish and Christian Scriptures have not been so much noticed,² nor could they be till quite lately. It is only within the last few decades that students have been sufficiently well provided with mythological texts and commentaries to be in possession of the necessary material, thanks to the labors of Birch, von Bergmann, von Bissing, Breasted, Brugsch, Budge, Chabas, Devéria, Grébaut, Guieysse, de Horrack, Jéquier, Lanzone, Ledrain, Lefébure, Legrain, Lieblein, Mariette, Maspero, Moret, Naville, Piehl, Pierret, Pleyte, Renouf, Sharpe, Spiegelberg, Wiedemann and others. The relationship of Egyptian mythology to Jewish religion is too large a subject to discuss fully; *haec peritioribus relinquo*; so I only mention a few traces of Egyptian influence in the Old Testament, but there are many others. I will then point out the more numerous Egyptian touches in the New Testament.

I. OLD TESTAMENT PARALLELS.

(1) In Gen. i. 1, God is represented as having created the heaven and the earth. How He did this is not stated, but the narrative does go on to say how light was created,

¹ Hieroglyphs are omitted throughout this article because of the difficulty in the composing room.

² Lieblein, Völker, Groff and Cheyne have touched on the matter.

(verse 3) namely, by the Divine Voice; "God said, Let there be light: and there was light." This formula "God said" is repeated at each subsequent act of creation, all of which acts are described as being performed by the Divine Voice. Here certainly we seem to get an echo of the ancient Egyptian *maat kheru*, or *maa kheru*, power, the creative power of the divine voice, an epithet usually placed after the name of the deceased who became a god, and inadequately translated "true of voice."

This voice re-appears in St. John's Gospel as the Logos (Word), Chapter i. 3, "All things were made by him." The great demiurgic gods of Egypt, as well as the beatified deceased had the power of uttering creative words. M. Moret has shown³ that the goddess Maat is assimilated to the eye of Horus (the sun), and represents light. Her symbol, the ostrich feather, is read *shu*, "light." The gods created the world by a luminous emission from their eyes and a sonorous emission of their voice. Thus light created reality. The offering of Maat to the god by the priest-king, a ritualistic scene very commonly portrayed and of the highest importance, is to give the god all which really lives; it is to put him in possession of all the material reality which he himself created and is not of an ethical significance. In fact, it is to offer the god to himself, an idea common to religions. [Moret.]

"Men came from Horus' two eyes; the gods were made manifest by his mouth." "Gods are manifested when he (the demiurgic god) speaks."

The word is made flesh according to the Egyptians by the assimilation of the sepulchral meal or offering (*per kheru*) to what comes out of the mouth of the god. Therefore the words *maat kheru* or *maa kheru* mean to have a creative voice like the gods, and it does not mean merely "true of voice" as usually translated.

³ *Le rituel du culte divin Journalier en Egypte*, 1902.

Dr. Breasted in his article in *The Open Court*, 1903, "The Philosophy of a Memphite Priest," commenting on the cosmological slab in the British Museum, sums up the Egyptian philosophical conception of the world thus: "Assuming matter, all things first exist ideally in the mind; speech or its medium, the tongue, constitutes the channel, as it were, by which these ideas pass into the world of objective reality." M. Maspero in a review of the same slab writes, "Things and beings 'said inside,' (i. e., thought), only exist potentially; in order for them to reach real existence it is necessary for the tongue to speak them 'outside,' and to solemnly proclaim their names. Nothing exists before having received its name *out loud*." This conception of producing existence by the voice is excessively ancient and is found in the Pyramid texts.

It is remarkable that the Egyptian name of Joseph, Gen. xli. 45, *Zaphnath-paaneah*, "The god spake, and he lives," seems to embody the tradition of creation by the divine voice. It is a well-known type of name, not ancient, used in the XXVIth Dynasty; Krall was the first to point out in 1886 the connection of *Zaphnath-paaneah* with this type of name. We find various gods' names used, but all the deities are of the first rank. Thus we have,⁴ "Horus spake, and he lives"; "Isis spake, and he lives"; Mut spake, and she lives," (woman's name); "Menthuth spake, and she lives," (woman's name; and similarly compounded names with Amen, with Ptah, Thoth, Khonsu, Bast and Anher or Onouris, (a form of Shu).

(2) Genesis i. 5, "And the evening and the morning were the first day."

The night also preceded the day in Egyptian cosmogony. "Tum, Osiris, Sokar, Tanen and Har-ur, who symbolized the setting sun, are anterior to the rising sun.

⁴ See Lieblein's *Dictionnaire de noms hiéroglyphiques et supplément*.

Hathor, the receptacle of the nocturnal sun, brings forth the rising sun."

(3) The formula, often used in the Bible (Neh. ix. 6) "Thou hast made heaven, the heaven of heavens, with all their host, the earth, and all things that are therein, the seas, and all that is therein" . . . , and (Ps. cxlvi. 6) "Which made heaven, and earth, the sea, and all that therein is" . . . , and (Is. xxxvii. 16) "Thou hast made heaven and earth"; Acts xiv, 15, and Rev. xiv. 7, have almost the same as that in the well-known hymn to Osiris, "He has made this earth with his hand"—another version of the creation—"its waters, atmosphere, vegetation, cattle and all birds, all fish, and creeping things."

A more elaborate parallel is found in a hymn to the Divinity of the time of Rameses IX, published and translated by M. Pierret:

"God, who has suspended the heaven and causes his disk to sail in the bosom of Nut, and guides it in the bosom of Nut, in his name of Ra; he has formed gods and men and all their generations; he has created all countries, both soil and liquid element, in his name of Creator of the world; he has brought water from its source; he gives growth to nutritive plants and produces the nourishment which proceeds from them, in his name of Nu [which here means the Nile]; he gives movement to the waters of the sky; he makes the water fall on the tops of the mountains, in order to make men live, in his name of Author of Life" . . .

Again, in a hieratic papyrus in the Cairo Museum we read in a hymn to Amen-Ra, that he is "Maker of grass for the cattle . . . of fruitful trees for men, causing the fish to live in the river, the birds to fill the air; giving health to those in the egg; feeding the bird that flies; giving food to the bird that perches; to the creeping thing

and the flying thing equally; providing food for the rats in their holes,"....

In fact so persistent is this very ancient form of address to the Almighty that it is even found in an Egyptian Christian prayer of the third or fourth century⁵ (in Greek), "O God Almighty who hast made heaven and earth, the sea and all that in them is, help me, pity me, wipe out my sins, save me now, and in the future age, through our Lord and Saviour Jesus Christ, through whom is glory and power, for ever and ever, Amen." In the Book of the Secrets of Enoch, which Dr. Charles says was written in Egypt, Enoch teaches his sons not to worship "vain gods who did *not* make heaven and earth."

(4) Exodus. At the Provincial Congress held at Lyons, 1878, M. Lieblein approximates Yahveh to the Egyptian god Khepera. These are his arguments: "The Hebrews did not know Yahveh before the time of Moses; Khepera was a Heliopolitan god, and Moses received his education at Heliopolis and is called by Manetho 'the Heliopolitan Priest'; the name of the god Khepera means 'to exist,' 'he who is,' and the name Yahveh has the same signification, 'he who is.' M. Lieblein also gives an illustration of the arrangement of the interior of the Egyptian ark on the processional boat, which is precisely similar to that of the Hebrew ark, as described in Ex. xxv. 20-22.

(5) In Neh. ix. 6, the *oneness* of God is insisted on; "Thou, even thou, art God alone." This also is paralleled in a hymn to Amen - Ra which uses these expressions, "Form unique; maker of all things which are; the one who is alone; producer of existences; numerous are his names." Beautiful things are said of the Divine Creator by the ancient Egyptians. "What is, is in his fist; what is not is in his side"; "He traverseth eternity"; "You cannot

⁵ *The Oxyrhynchus Papyri*, Part III. 1903. No. 407.

see him"; "Thy rays are from a face which is not known"; "He is for ever"; "He has spread out the heavens, and put the earth underneath"; "Great God of primæval time."

We do not call the Egyptians monotheists, but henotheists; they were capable of thinking of one god at a time, and so making him the only one for the time being.

(6) Job xxix. 6. "When I washed my steps in butter." At the Congress of the French Orientalists held at St. Etienne, 1875, Dr. A. Wiedemann remarked that the whole Book of Job displays an Egyptian influence. He refers especially to the Egyptian touch in this passage. The English translation "butter" is, according to Gesenius, better translated "*milk*." This too makes better sense.

On a stele in the Egyptian museum of Florence, we read, "may Isis give you milk, so that you may wash your feet on the silver stone and the pavement of turquoise." Dr. Wiedemann notices that while this expression (to wash your feet in milk) in Job's mouth only means a state of happiness, it had a religious significance in ancient Egypt. Owing to the soiling of the feet by the earth, the skin of the soles was removed after death, and the wound washed in milk, as if the deceased were alive. The "silver stone and the pavement of turquoise" doubtless formed the floor of the Hall of Justice, though unfortunately we do not possess a detailed account of it. Besides these remarks of Dr. Wiedemann, an interesting comparison may be made of the same chapter of Job, verses 11-17, and a portion of the hieroglyphs on the sarcophagus of Unnefer, a royal scribe and priest (published by Karl Piehl, and now in the Cairo museum). I give the text in English, from Karl Piehl's translation in French of the hieroglyphs:

"When the ear heard me, then it blessed me; and when the eye saw me, it gave witness to me. Because I de-

livered the poor that cried, and the fatherless, and him that had none to help him. The blessing of him that was ready to perish came upon me and I caused the widow's heart to sing for joy. I put on righteousness and it clothed me: my judgment was a robe and a diadem. I was eyes to the blind, and feet was I to the lame. I was a father to the poor, and the cause which I knew not I searched out. And I brake the jaws of the wicked and plucked the spoil out of his teeth."

Unnefer after invoking the gods is made to say, "I am a man devoted to his father, the favorite of his mother, the friend of his brothers. I have not done what ye (the gods) hate on earth. Give me bread in the city of eternity, and water in the perfect land which is in Neferkheart. For I am a man by my actions, (?) I am true of heart, without weakness; kindhearted, obeying God's will. I am a favorite in my city, a benefactor of my country, mild towards every one. I am a man of vigorous build, of fine countenance, amiable and contented. I am courageous in the moment of distress, gentle of speech, perfect in words. I am a fertile region to him who is in poverty, and every one has confidence in me. I have entered the way of moderation. I am efficacious in my words, wise in counsel; a good guide. I protect the weak against the strong, so as to facilitate the passage of everybody. I am a perfect noble, doing the will of the gods. I am the friend of my comrades. I am a liberal man to the poor, without boasting of what I have given. I am the friend of truth, the enemy of lies, a man who knows what God has forbidden"...

This diffuse, childlike description of a good man compares as regards morality very favorably with Job's literary, worked-up, more artificial expressions—Unnefer's sayings are of a milder character than Job's. There is nothing in them about breaking the jaws of the wicked.

He is also on his guard not to boast of what he has given, which Job certainly does.

Though Unnefer's sarcophagus is of late date, the ideas he uses are very ancient.

(7) Ps. cxi. 10. "The fear of the Lord is the beginning of wisdom." See also Job xxviii. 28, Prov. i. 7 and ix. 10. This is very like "The beginning of wisdom is the way of Amen," a sentence which occurs in a hymn to Amen in the Anastasi Papyrus in the British Museum. Literally it is "The beginning of wisdom is the *water* of Amen." The Nile was the great highway, hence "the water" was used to signify "the way," i. e., "will, command, or rule."⁶

(8) Ezekiel (xviii. 7) in his description of the just man says, "He hath given his bread to the hungry, and hath covered the naked with a garment."—The just man (according to Egyptian religion as recorded in Chapter CXXV of the Book of the Dead) who has been purified after death in the Hall of Maat, also says that he has given "bread to the hungry; water to the thirsty; clothes to the naked; a boat to the shipwrecked." The boat, so indispensable to a dweller on the Nile, but absolutely useless to a Jew, with the dried-up river courses of his native land, has disappeared in Ezekiel's list. Ezekiel has been called a "literary" prophet, and he was essentially a "scholar"; so it is not surprising that his imagination should have been tinged with foreign ideas and expressions, as we also see in his vision. I refer to this latter when commenting on Revelations.

As regards the Egyptian analogies in the Gospels, I have already mentioned the connection of the Logos (word) of St. John with the Egyptian *maat kheru* power. The virgin birth is paralleled in the details of the birth of Amenhotep III depicted on the walls of the temple of Amen at Luxor, where, among other scenes, Amenhotep's

⁶ Goodwin, *Records of the Past*.

mother, Mut-m-ua, is represented listening to Thoth, the master of divine words.⁷

The innumerable figurines of Isis suckling the infant Horus are too well known to require a detailed account of them. The blood of Isis is mentioned in Chapter CLVI of the Book of the Dead as a protection to the deceased, and her amulet, called the buckle(?) is very common, and



THOTH ADDRESSING MUT-M-UA.

From *Mission archéologique française au Caire*. Vol. XV, Plate LXIX.

often made of red jasper, or of carnelian, to represent the color of blood.

It is in Revelations that so many Egyptian traits occur, as well as in the book of Ezekiel, and the Egyptian element in both may have caused the difficulty of getting these works into the canon. Whoever wrote the Apocalypse seems to have been a Christianized Jew, acquainted

⁷Noticed by Sharpe in his little book *Egyptian Mythology and Egyptian Christianity*.

probably with the Book of the Dead and with the symbolism engraved on Egyptian scarabs.

II. NEW TESTAMENT PARALLELS.

The Jews, who were totally unable to express themselves in pictorial and plastic art, which was forbidden them by their religion, poured all their genius into their sacred writings. The very opposite of the Jew, the ancient Egyptian was particularly skilful in sculpture and wall-decoration. But the peculiar formation and position



ISIS NURSING HORUS.

of the Nile valley necessarily reacted on the Egyptian imagination in various ways, and made the theology of the people too full of local color to be a world-religion; especially as the Egyptians were a non-maritime and a non-colonizing power, and so did not spread over the world.

An especially Egyptian touch in the Apocalypse is the great number of animals mentioned. Christianity is

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not without its animal symbolism, of which the most prominent examples are the Lamb of God and the Dove of the Holy Spirit. Who that has seen the altarpiece of "The Adoration of the Lamb," at St. Bavon, Ghent, could say that symbolic animal worship was not a feature of Christianity? Even the Protestant publication of "The Temple Bible" has a picture of a Lamb on its cover.—But besides animals, M. Lefébure has shown that the Egyptians deified all the aspects of nature; the atmosphere, water, dew, earth, wind, the Nile, sky, heat, drought, damp, cloud, tempest, moon, stars, sun. The same kind of treatment occurs in Apocryphal and Gnostic Acts, where the throne and the cross are deified, and the cross speaks.

The following imagery used in Revelations can be paralleled in Egyptian mythology:

- (1) Rev. i. 8. Alpha and Omega.
- (2) Rev. i. 13, The golden girdle.
- (3) Rev. i. 14, The wool-white hair.
- (4) Rev. ii. 11, The second death.
- (5) Rev. iv. 6, The sea of glass.
- (6) Rev. iv. 6, The four beasts full of eyes.
- (7) Rev. vii. 1, The four angels at the four corners.
- (8) Rev. vii. 17, The tears wiped away.
- (9) Rev. ix. 10, The locusts with scorpion tails.
- (10) Rev. ix. 19, Lion-headed horses with serpent-headed tails.
- (11) Rev. xix. 12, Many crowns.
- (12) Rev. xx. 1, 2, 3, Chaining the dragon.
- (13) Rev. xx. 10, 11, 12, The lake of fire.
- (14) Rev. xxi. 18, The wall of Jasper.

1. Alpha and Omega.

Rev. i. 8, "I am Alpha and Omega, the beginning and the ending, saith the Lord, which is, and which was, and which is to come" . . . See also Is. xlv. 6, "I am the first

and I am the last," and Is. xlvi. 12. This is not unlike the beginning of Chapter XVII of the Book of the Dead, as translated and noticed by Renouf: "I am he who closeth, and he who openeth, and I am but One." But the texts which contain this opening phrase do not agree, and this sentence is absent from the primitive recension on the walls of Horhotep's tomb. The XVIIth Chapter is one of the most remarkable and ancient chapters in the Book of the Dead, where the deceased assimilates himself to the Deity as primordial God and Creator (Pierret). It was so obscure to the Egyptians themselves, that it is full of their notes and explanations, and questions, such as "What is that?" mixed up in the text.

The latter part of the much quoted sentence of Rev. i. 8, "Which is, and which was, and which is to come" also seems to have an Egyptian analogue, as the Egyptians divided mankind into the *Pait*, the past, or dead; the *Rechit*, or present, living generation; and the *Hamemet*, the future unborn generation. On an obelisk of the XIIth dynasty, at Alnwick Castle, Osiris is called "Lord of Being and Not-being," i. e., of everything.

(2) *The Golden Girdle*, and (3) *The Wool-white Hair*.

Rev. i. 13, 14. "One like unto the Son of man, clothed with a garment down to the foot, and girt about the paps with a golden girdle. His head and his hairs were white like wool"

One of the vignettes in the beautifully illustrated papyrus of Ani, (c. 1500 B. C.) in the British Museum, has a representation of Ani, the man for whom the papyrus was made, being led into the presence of the enthroned Osiris by the god Horus, who acts the part of *Psychopompos*. Ani wears his hair in jet-black curls. He is "girt about the paps with a golden girdle," and is in a respectful and timorous attitude, slightly bending forward. In the front of this vignette is another representation of





HORUS LEADING ANI BEFORE OSIRIS.
From the *Papyrus of Ani*, Plate IV.

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Ani, after his beatification, where he kneels before Osiris in the attitude of prayer and supplication. Ani wears the same white and golden garment "down to the foot," but his hair is now "white like wool"; it is adorned with a cone the significance of which is not understood.

There is also a representation of Queen Thiti beatified (XVIIIth dynasty), crouching on a red cushion, and naked except for jewelry, with a similar head "white like wool." This is adorned with an *uraeus*, serpent, the sign of the queen's rank.

(4) *The Second Death.*

Rev. ii. 11. "He that overcometh shall not be hurt of the second death."

The "second death" or annihilation is frequently mentioned on Egyptian coffins. On that of the lady Tauheret, a singer of Amen, (translated by Piehl,) is written "O mother Nut (the sky) who spreadeth her wings over me, grant that I may be among the stars Achem-sek, and among the stars Achem-ured; that I may not die the second death." On the coffin of Pa-du-pep is written "I make thy way among the stars; thou shalt not die for ever." On the coffin of general T'aho, "Thou shalt not die the second death." The Egyptians called the blessed dead "the living ones," as is written on the coffin of Nesi-pa-ur-shef,⁸ where he invokes (as well as the gods) "Ye resting ones who are in Duat, ye who repose, ye mighty souls, ye *living ones* who are in the grave, . . . come ye, protect the Osiris, the divine father of Amen Ra, king of the gods, Nesi-pa-ur-shef, true of voice (having the creative voice). Grant that he may rest as those who are resting. . . . May he come and go without repulse at the doors and secret pylons of Duat. May his soul come out and do as he likes. May he refresh himself in the beams of the disk," etc.

⁸ In the Fitz William Museum, Cambridge, and translated by Dr. Budge.

The *mit* are the dead, those who have died the second death, i. e., annihilation. (Renouf.)

The second life is the logical consequence of not dying the second death. This also is frequently referred to. An instance is on the obelisk already mentioned, where Osiris is glorified by the deceased for giving the "delicious breath of life" to the royal son, Beba, in his renewed, or second life. In fact, this expression on certain monuments replaces, after the name of the deceased, the more usual *maat kheru*. In the CXXXVth Chapter of the Book of the Dead, it is written "If this chapter is known to the deceased, he shall not die a second time."

(5) *The Sea of Glass, or Hyaline Sea.*

Rev. iv. 6, "And before the throne a sea of glass like unto crystal"; and (Rev. xxii. 1) "A pure river of water of life, clear as crystal proceeding out of the throne of God and of the Lamb."

Dr. Budge has drawn attention to the remarkable fact that the throne of Osiris, in a vignette of the Hunefer papyrus (c. 1370 B. C.) is represented as placed on water. The Book of the Dead mentions the water beneath the throne of Osiris, in Chapters CXVII and CXXV, (Renouf's translation and notes.)

Chapter CXVII, "I am he who produceth the water which balanceth his throne, and who maketh his way from the great valley." Here the deceased is identified with the Nile and its inundation.

Chapter CXXV, "But who is he whose roof is of fire, and whose walls are living *uraei*, [this refers to the shrine where Osiris sits on his throne] and the floor of whose house is of running water? Who is it? It is Osiris."

There seems to be an echo of this sacred water beneath the throne in the third vision of the "Shepherd of Her-mas," where a tower—the Church—is built on water.

Hermas asks, "Why is the tower built upon the water?" He is told "Because your life is and shall be saved by water" (baptism).

Victorinus, Bishop of Petavio (martyred 303, A. D.) also allegorized the sea or river proceeding from out of the throne of God as symbolic of the gift of baptism.

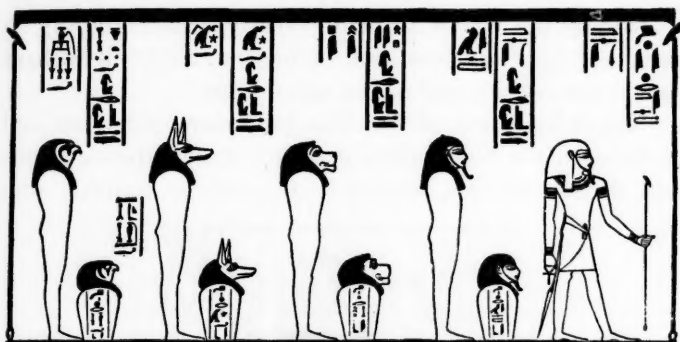
According to the chronicles of Jera'hmeel the throne of glory is so important that it was one of the seven things created before the world. The earth was made from the snow beneath the throne of glory.⁹

(6) *The Four Beasts Full of Eyes.*

Rev. iv. 6. "And in the midst of the throne and round about the throne were four beasts full of eyes before and behind. And the first beast was like a lion, and the second beast like a calf, and the third beast had a face as a man, and the fourth beast was like a flying eagle." (Compare also Ezekiel's vision, Ez. i. 4).—Sir J. G. Wilkinson, as long ago as 1841, suggested a connection between these four beasts and the four funerary genii of the Egyptians, which were also near the throne. Their names are (1) Amset or Mestha, (2) Hapi, (3) Duamutef, (4) Qebhsennuf. The first is represented man-headed, the second dog- (or ape-) headed, the third jackal-headed, the fourth hawk-headed. This order of mention is almost always adhered to. These four genii presided over the intestines and interior organs of deceased persons, and four goddesses, Isis over Amset, Nephthys over Hapi, Neith over Duamutef, and Serq over Qebhsennuf acted in consort with them. As Dr. S. Birch wrote "These genii represented the four cardinal points of the compass, and the deposit of the viscera symbolized their dispersion to those cardinal points; the viscera, according to Egyptian notions, being the

⁹In Hastings' *Dictionary of the Bible*, 1902, Vol. IV, p. 425, it is stated that "The sea of glass has no exact parallel in previous or contemporary literature." (!)

source of all evil to man;" or as Professor Wiedemann expresses it, "The four genii had charge of the viscera of the dead, and were bound to appear at the judgment, because it was not the divine ego of a man which sinned, but only his internal organs." Therefore the four funerary genii (also called the children of Horus, the four



QEBHSENNUF. DUAMUTEF.

HAPI.

AMSET.

FOUR FUNERARY GENII:

Lenormant's *Histoire ancienne de l'orient*, III, 244.



FOUR GENII ON THE ALTAR.

Sharpe's *Egyptian Mythology and Egyptian Christianity*, p. 52.

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children of Osiris, the four genii of the Amenti) very nearly always appear in the scene of the *Psychostasia*, standing on, or sometimes over, the lotus flower, the symbol of the resurrection, which was placed in front of the enthroned Osiris.

In the papyrus of Neb-Qed, in the Louvre, their names are written under the throne, instead of their figures being drawn. These four genii are, as Sharpe says, "The friends and advocates of the trembling sinner," and Sharpe gives an illustration (here reproduced) of a scene on a funeral stele in the British Museum, of the date of Rameses II, where the four genii appear on the altar before the seated Osiris, their heads being turned towards the suppliant, as if they had been put, or had put themselves there as an offering, instead of the usual lotus.

The inhabitants of the Mesopotamian valley, as well as those of the Nile valley, had their human-headed bulls and lions; and this similarity of symbolic animals who



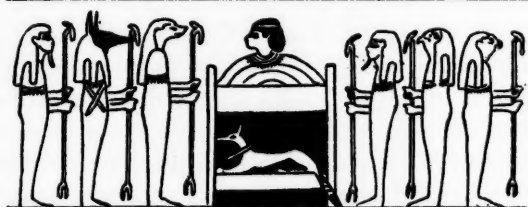
VIGNETTE OF DUBLIN PAPYRUS.
Nephthys, Osiris, Isis.

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were intermediary beneficent beings between God and man, supports the current theory, that Egypt was civilized from Babylonia. Mr. Collingwood¹⁰ who has studied the question of the four beasts, writes that "St. John's description of them is not that given by Ezekiel, and shows knowledge independent of canonical Scripture." This independent knowledge he ascribes to the Chaldaean astrologers. But though it is possible that Ezekiel, whose vision is dated from the river Chebar (593-592 B. C.) was influenced by the Chaldaean form of the genii, St. John is much nearer the Egyptian form, for he leaves out the wheels, and retains Egyptian traits, such as the four beasts

¹⁰ *Astrology in the Apocalypse*, 1886.

being "round about the throne," for they are always placed very near the enthroned Osiris, in front of him. But in one Egyptian point Ezekiel's description is more exact, namely in the *order of mention* of the genii. In Ezekiel the *faces* of the four living creatures are (1) man, (2) lion, (3) ox, (4) eagle. Observe the order; it is preserved in the mention of the four funerary genii or children of Horus: (1) Amset, man headed; (2) Hapi, dog-headed; (3) Duamutef, jackal-headed; (4) Qebhsennuf, hawk-headed. That in the course of so many centuries the dog has become a lion, the jackal an ox, and the hawk an eagle in the Hebrew version is not surprising. But it



GENII AROUND A COFFIN.

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Papyrus in Trinity College, Dublin.

is surprising that the order is so strictly kept. The order in Revelations is (1) lion, (2) calf, (3) man, (4) eagle. Thus both books seem to have access to Egyptian symbolism, as regards the mention of the four beasts and other passages; the Apocalypse is full of it.

In the XVIIth Chapter of the Book of the Dead we are told of the "seven luminous ones who follow after the confined one," i. e., Osiris. Four of these seven are the four genii, and they are represented in the vignettes of papyri with their names often written over them, standing by the "confined" deceased. These seven luminous ones are the constellation of the Great Bear, or the "Thigh," as the Egyptians called it. In the papyrus of Ani, it is

called "The seven bright ones who follow their Lord." Doubtless the four beasts had an astronomical origin. The detail "Full of eyes before and behind" represents the starry sky.¹¹ It has been suggested by Mrs. Nuttall that Osiris was originally the pole-star, and as sidereal worship seems to be more archaic than solar worship, her view seems quite possible.

The remote antiquity of the four genii, or children of Horus is fully certified to be 5,000 or more B. C.; for these genii are frequently mentioned in a fully developed form in the Pyramid Texts, which are considered by M. Maspero to be pre-Mena. In the text of Pepy I, of the fourth millennium B. C. we find "O children of Horus, carry your father, this Osiris Pepy (the deceased king); guide him, make him survive, make him open his mouth, and hold himself upright." This shows that the worship of the four genii, as powerful agencies in favor of man after death, was even fully developed in the fourth millennium B. C. and formed part of the most ancient mythology of the Egyptian religion.

The four genii are adopted into apocalyptic Judaism, as well as into Christianity, as is seen from the Book of Enoch (first and second centuries B. C.), xl. 2, 9: "And I looked, and on the four sides of the Lord of Spirits I saw four presences.... I asked the angel of peace.... 'Who are these presences?'.... And he said to me, 'This first is Michael,¹² the merciful and long-suffering; and the second who is set over all the diseases and the wounds of the children of men is Rufael; and the third who is set over all the powers is Gabriel; and the fourth who is set

¹¹ See Gunkel *Zum religionsgeschichtlichen Verständnis des Neuen Testaments*, which appeared in English in *The Monist*, 1903. Stars are conceived as eyes of the Divinity. The Egyptians called the sun and moon "The eyes of Horus". "The two eyes illumine the world."

¹² Canon Cheyne says of this great archangel, that he "has the work of subduing the *evil principle* at the end of the present age." In Chapter XVII of the Book of the Dead the four funerary genii protect Osiris against "*evil principles*."

over the repentance and hope of those who inherit eternal life, is named Fanuel' " (afterwards Uriel).

In Enoch xc. 21, there is a reference to seven chief angels as the "seven first white ones," which agrees with the "seven luminous ones" already mentioned. In Isaiah



THREE EVANGELISTS: MATTHEW, MARK, AND LUKE.

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A plinth of the twelfth century in the Campo Santo, Pisa. The fourth side is against the wall, and St. John seems never to have been represented in this group.

lxiii. 9, we read, "And the angel of his presence saved them; in his love and in his pity he redeemed them, and he bare them and carried them all the days of old," thus recalling the benefits of the four genii to mankind.

The well-known symbols¹³ of the four Evangelists are taken from the Apocalypse, with the Egyptian order of mention restored: St. Matthew, man-headed; St. Mark, lion-headed; St. Luke, ox-headed; St. John, eagle-headed. Here we have the last echo of the genii of Amenti.

The four genii also very frequently appear on coffers, stone sarcophagi, and on wooden painted mummy cases; also on painted wooden stelæ of Ptolemaic date. The mummy cases date from about B. C. 1400 to Roman times. On the coffer of queen Ma-ka-ra, of the XVIIIth dynasty, are four remarkable speeches of the genii:

Mestha (or Amset) says: "I am Mestha thy son who



THE FOUR GENII CARVED ON AN ANCIENT CROSS, HEMSBY, NORFOLK-SHIRE. 3849

Twining's *Symbols and Emblems of Early and Mediæval Christian Art*, p. 108.

loves thee; Lo! I have come in peace to make thee receive incense, oil, stuffs, offerings of cakes and herbs, O Osiris, divine wife, Ma-ka-ra," etc.

Hapi says: "I am Hapi thy son who loves thee; verily I am come in peace to make thy soul come out, so that it may hover about any place it likes, O divine wife," etc.

Duamutef says: "I am Duamutef thy son, who loves thee; I am come to make thee go out and come into Neter-khert; may thy soul not be separated from thy body O Osiris, divine wife," etc.

Qebhsennuf says: "Verily I am come to make thee

¹³It is curious that "these symbols of the four Evangelists were in their combination held to be symbolical of the Redeemer, in the fourfold character then universally assigned to Him, as man, as king, as high-priest, and as God." Mrs. Jamieson, *Sacred and Legendary Art*.

reach heaven; to cross the celestial abyss, and mingle with the stars, O divine wife," etc.

On the black basalt sarcophagus of the lady Tent-Hapi, in the Louvre, the four genii appear; Amset brings her *ka*,¹⁴ ego, double; Hapi brings her *ab*,¹⁵ heart; Duamutef brings her *ba*,¹⁶ soul; Qebhsennuf brings her *sahu*,¹⁷ or mummified body.

In the tomb of Neb-unnef (XIXth dynasty) Amset offers him his *ka*; Hapi offers him his *ab*; Duamutef offers him his *ba*; but Qebhsennuf offers, instead of the *sahu*, the deceased's *khaibit*, or "shadow," which has been explained fancifully as the light in heaven of the soul on earth; compare the pictorial halo of Christian saints.

On the sarcophagus of Hor-sa-Isis, son of the lady Ta-du-a (XXth dynasty) in the Bibliothèque Nationale, this speech of Amset is written: "O Osiris, Hor-sa-Isis, creative of voice, blessed one with the great God, Lord of Heaven, over all the gods; (who art) living as a god in Him, I am Amset, I am thy son Horus, who loves thee, I protect thee every day; I have made thy house (tomb) strong. . . by order of Ptah; I have repulsed thine enemies for thee as I repulsed Apap from Ra. Thoth subdues thine enemies; Anubis makes whole thy maladies, O Osiris!"

On the curious mummy-case of a lady, Mut-shep-n-Chonsu, daughter of Auf-kat, in the Louvre, the four genii are represented standing in the folds of a large serpent, which is spitting out fire at the enemies of Ra, and of the deceased.

On the mummy case of the daughter of Dioscoros (Bibliothèque Nationale, second century A. D.) in order to help her resurrection, the four genii are found; also the god Anubis and two groups of Isis suckling the infant



Horus. These groups symbolize the new life promised to the daughter of Dioscoros. Written in gilded uncial letters on her mummy are the words

ΔΙΟΣΚΟΡΟΥ ΕΥΨΥΧΙ,

"O daughter of Dioscoros, farewell!"

The four genii are conspicuous figures in the Rhind Papyrus, translated by Dr. Birch. The man for whom the papyrus was made, Menkara (born B. C. 68) is laid out as a mummy in the Pool of Chons, surmounted by the sacred eye. Over him are the genii, in abnormal order, Khebsennuf, Hapi, Amset, Duamutef. Of the mummy it is said, Amset rejoices to embalm him; Hapi delights to obliterate his faults; Khebsennuf rejoices he has passed from the place of preparation. In the fourth Plate the four genii adore Osiris and say, "We come to our father (Menkara) when he approaches the underworld. He did no evil in his day. . . . We declare his goodness before the Lord of the Empyrean region. He listens to our words, the Lord of the West."

The four children of Horus are found on the linen stuccoed disk called "Hypocephalus," a mystic amulet full of elaborate animal imagery typifying the resurrection.

The immense length of time during which belief in the genii endured is very remarkable, and shows the feeling of timidity in the ancient Egyptians, and how much they dreaded the perils which were awaiting them after death.

(7) *Four Angels at the Four Corners of the Earth.*

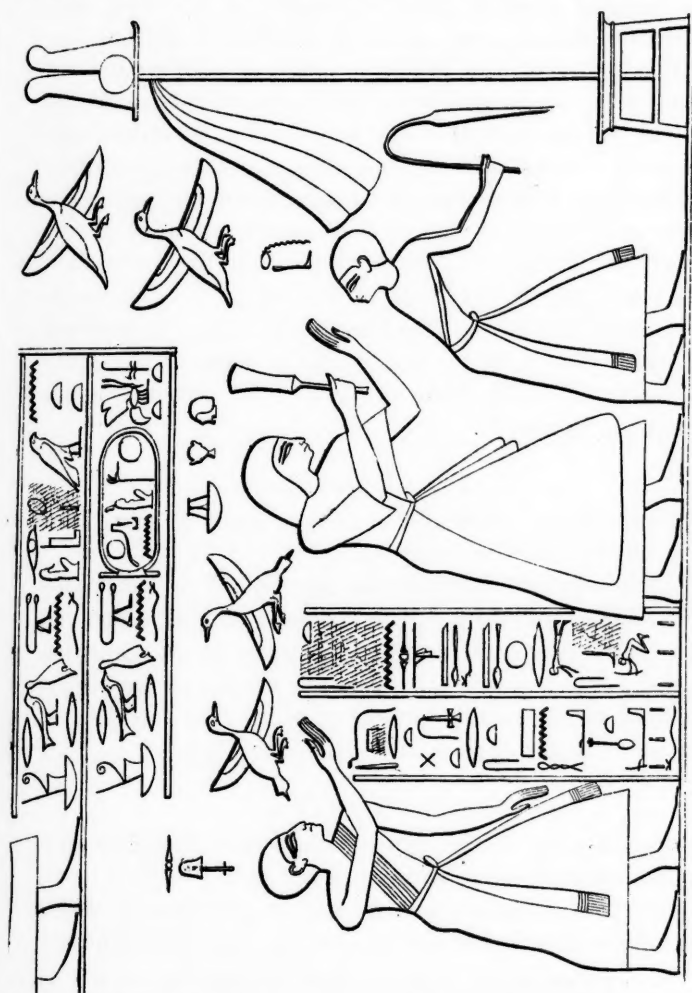
Rev. vii. 1. "Four angels standing on the four corners of the earth." These angels recall to one's mind the funereal genii, who, as has been already mentioned, represented the cardinal points of the compass. According to one Egyptian version of the creation, the genii posted themselves at the corners of the earth and received the four angles of the firmament (imaged as a ceiling of iron

upon
scepter



Dead
their s

upon which the divine ocean rolled) on the point of their scepters. Therefore they are called in the Book of the



LETTING FLY THE GEESE.

From Lepsius, *Denkmäler aus Aegypten und Aethiopien*.

Dead "The four glorious ones who are conspicuous by their scepters." They are also called (Chapter XVII)

"The pillars of the god Shu." In Chapter LX the deceased prays that he may have power over the divine beings "who have mighty arms in their shoulders," i. e., those who uphold the sky, the four genii, or children of Horus.

The hieroglyph for storm, tempest, etc., shows the sky falling away from the four scepters, its supports. At the Sed festival, or festival of the Royal Fillet, identified with the *uraeus* which adorned the king's forehead, (coronation festival) four geese, which personified the genii were let fly to the four corners of the horizon; each goose was apostrophized thus: "Go to the north¹⁹ (to the south, east, west) and say to the gods of the north (of the south, east, west) that Horus (the king) son of Isis has assumed the great double crown and that the king of the south and north (here his name is given) has taken the double crown (of Egypt)."

(8) *Tears Wiped Away.*

Rev. vii. 17. "And God shall wipe away all tears from their eyes." And Is. xxv. 8.

This beautiful expression is paralleled²⁰ in the Hymn to the Nile, the work of the scribe Ennana, which has often been translated, and most recently by M. Guieysse, in the *Recueil*, 1900. In the sixth stanza of this hymn we read, "Thou driest the tear of every eye," literally "is drunk the water of eyes all by him (the Nile)."

(9) *Scorpion Tails.*

Rev. ix. 10. (The locusts) "had tails like unto scorpions, and there were stings in their tails."

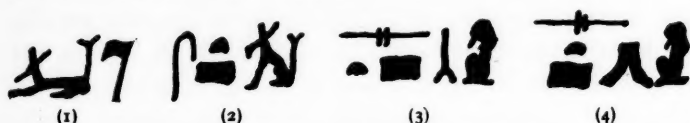
Scorpion or forked tails are rare in ancient art. There is a deity with a forked tail on a broken seal, from Knossos,

¹⁹It is remarkable that of the four horses of Zechariah's vision (chap vi 6) it is mentioned that the black horse goes to the north courts and the white follows, and the grisled horse goes towards the south.

²⁰The Rev. F. C. Cook has noticed the connection in *Records of the Past*, Vol. IV.

Crete. Also the god Bes in Dorow and Klaproth's *Antiquités Egyptiennes*, Plate XIV, No. 721, is figured with a forked tail, and holding a drinking tube inserted in a large amphora.

The pre-Mena god Set is represented in hieroglyphs as an animal with a forked tail thus:



How important the forked tail was, is shown by its being placed separately from the animal's body.

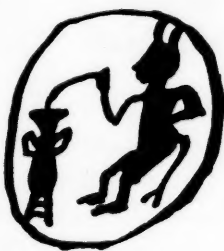
That there was a connection between Set and the scorpion is shown by a rare scarab in the Edinburgh Museum (broken).

On the stele of the year 400, found in Tanis, Set wears



DEITY FROM CRETE.

Publ. by Dr. A. J. Evans.



BES.

D. and K. XIV, 721.



SET.

Edinburgh Museum.

a long pigtail, ending in a fork, which appears to issue from the god's crown, and two small forks are over his forehead.

(10) *Lion-headed Horses with Serpent-headed Tails.*

Rev. ix. 19. "The heads of the horses were as the heads of lions. . . . for their power is in their mouth, and

in their tails; for their tails were like unto serpents, and had heads, and with them they do hurt."

Animals with serpent-headed tails, and serpents coming out of their limbs and bodies are a peculiarity of Egyptian scarabs, but though more common than examples of scorpion or forked tails, they are not very common. In the Ashmolean Museum, Oxford, there are two scarabs of lions with serpent-headed tails, such as I have not found elsewhere, Figs. 1 and 2. (Fig. 1 seems to be a lioness). Lanzone has figured a lion with serpent issuing from its foot²¹ and also a horse with a serpent springing from his hoof, Fig. 3.

This horse, from the accompanying hieroglyphs we



FIG. 1.



FIG. 2.



FIG. 3.

know to be a symbolic representation of Pharaoh, for the inscription runs: "Beautiful lord of the two lands." This is the common formula used for the king on scarabs. The *uraeus* serpent is the symbol of the divinity and royalty, which were fused in the Egyptian imagination. Another quadruped found with serpent issuing from its foot is the cat, Fig. 4, (Ashmolean). Dorow and Klaproth have also figured a similar one. These cats with *uraei* are rare. Professor Petrie has figured a cat wearing the double crown of Egypt, Fig. 5; the ostrich feather behind is a divine symbol. Of birds, the hawk, representing Horus, wearing the crown of Lower Egypt, Fig. 6 (Queen's College, Oxford, Collection), and Amen Ra as a goose, Fig.

²¹ Terza dispensa, page 272, of his *Dizionario di mitologia egiziana*.

7, (*Naucratis*, Vol. I) are found with serpents issuing from the foot.

Of gods, Set and Bes are distinguished as being depicted with a serpent, or serpents issuing from their body, or from their limbs, or else the serpent is stationed in the field beside, or behind them, see Fig. 8 (Louvre) of Set, and Fig. 9 of Bes (Lanzone).

There is also an Etruscan example of a serpent-headed tail on an ancient vase.



FIG. 4.



FIG. 5.



FIG. 6.



FIG. 7.



FIG. 8.



FIG. 9.

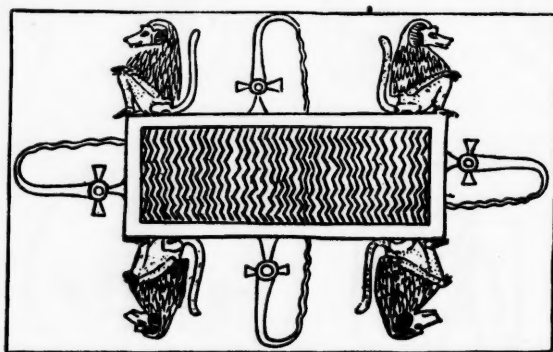
(II) *Many Crowns.*

Rev. xix. 12. "And on his head were many crowns." The Pharaohs wore the two crowns together of North and South Egypt, combined at an early date, and I am not aware that the kings of any other ancient country wore more than one crown at a time. Like the feathers of Amen and the plumes of Osiris, these two crowns, and other insignia of the gods and goddesses, became amulets, and models of them in faïence are to be found in museums.

(12) Chaining the Dragon.

Rev. xx. 1, 2. "And I saw an angel come down from heaven, having the key of the bottomless pit and a great chain in his hand. And he laid hold on the dragon, that old serpent, which is the devil." . . .

Sutu is a kind of Egyptian devil or dragon, eater of hearts, from whom the deceased prays to be delivered. In Chapter XVII of the Book of the Dead the deceased prays: "Deliver me from the great god who carrieth away the soul, who eateth hearts, etc. Who then is this? It is Suti." In Chapter XXVIII deceased again prays: "Let



THE LAKE OF FIRE.

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not my heart be given to him (Suti). In Chapter CVIII we read: "Then Sutu is made to flee with a chain upon him of steel." Sutu is sometimes found fused with the great serpent Apap, and he is represented on the sarcophagus of Seti I chained, with the scorpion goddess Serq lying over the chain. The exact meaning of the goddess in this position is unknown, as so much else in Egyptian mythology.

(13) The Lake of Fire.

Rev. xx. 14. "And death and hell were cast into the

lake of fire. . . . And whosoever was not found written in the book of life was cast into the lake of fire."

The Egyptian lake of fire is pictured with four apes seated at its corners, and four signs of fire between them. I have not been able to discover its object. In Chapter CXXVI of the Book of the Dead we find the deceased praying, "Hail ye four apes. . . . do away with my evil deeds and put away my sin. . . . Oh grant that I may make my way through the underworld, and let me enter into Restau, let me pass through the hidden pylons of Amenti."

The four apes answer, "Come then, for we have done away with thy wickedness, and we have put away thy sin. . . . Enter therefore into Restau, and pass through the hidden pylons of Amenti."

(14) *The Wall of Jasper.*

Rev. xxi. 10. "That great city, the holy Jerusalem"; and 18th verse, "And the building of the wall of it was of jasper."

The fields of Aarru, to which the ancient Egyptian thought that the beatified deceased person went after death, had a wall of *iron* round them. Iron was used as a precious metal, being scarce and difficult to work, long before becoming a useful metal. The wall round the Egyptian Elysian Fields was not for strength, but it was made of the then most precious material known, showing the extreme antiquity of the remote time when this mythology arose. In Chapter CIX of the Book of the Dead, the deceased says: "I know the Sekhet Aarru of Ra, the walls of which are of iron." Again, in the papyrus of Nu, Chapter CXIX, deceased says: "Hail, ye Sekhet Aarru, the walls of which are of iron!"

Iron, on account of being magnetic, a mysterious property to the ancients, was also sacred and amuletic in Egypt.

In spite of having made these few achæological re-

marks, addressed to the intellect, I am thoroughly convinced of the truth of Paracelsus, when he says that "We must read the Bible more with our heart than with our brain," because the heart is greater than the mere brain:

"For knowledge is the swallow on the lake
That sees and stirs the surface shadow there
But never yet hath dipt into the Abyss,"

but

"Who speaks the things that Love him shows
Shall say things deeper than he knows."

ALICE GRENFELL.

OXFORD, ENGLAND.

THE PERIOD OF THE EXODUS.

OUR knowledge of the Exodus is mainly derived from the Bible and from Manetho as quoted by Josephus.

It is not necessary to recapitulate the account contained in the Book of Exodus, of the plagues, the variable-ness of Pharaoh, the flight, the pursuit, and the catastrophe. It is imprinted on the mind of the reader from childhood.

The narrative of Manetho is less familiar. It is in brief as follows:

An Egyptian king, Amenophis, desired to behold the gods, and, in accordance with priestly advice, purified his kingdom by separating all the lepers and unclean persons from the rest of the people, and assigning for their residence the old city of Avaris, once the stronghold of the Shepherd Kings. These unfortunates selected as their ruler a priest of Heliopolis named Osarsiph, who enacted a set of rules forbidding worship of the Egyptian gods; and caused them to fortify their city and prepare for war with the king. He further invoked the aid of the expelled race who had occupied Jerusalem,—and who came to his assistance with an army of two hundred thousand men. Amenophis did not venture to engage his allied enemies, but retired with his army to Ethiopia, where with a multitude of fugitives, he remained thirteen years. Osarsiph, whose name had been changed to Moses, ravaged Egypt during all these years; burning cities and villages and de-

stroying the images of the gods, eating the sacred animals and expelling the priests. At the end of the thirteen years—the prophetic period fixed for his exclusion—Amenophis returned with a great force, and Ramses his son with other forces, and encountered the foreigners and unclean people, defeated them, slew multitudes of them, and pursued them to the bounds of Syria.

While the discrepancies of these accounts are quite obvious and are justly emphasized by Josephus, some fundamental facts are common. There was an oppressed class regarded by the Egyptians with aversion as impure and irreligious, settled apart in northeastern Egypt. During the latter part of their stay, great evils and troubles befell the nation and government. They were pursued from the country.

It was for some time supposed that contemporary Egyptian annals threw no new light on these important and unique events. I will endeavor to show that this is not the case, and that other sources of information enable us to contemplate the period of the Exodus somewhat more clearly, with its general activity and wide spreading innovations.

The latter part of the great Sallier Papyrus contains a concise account of the events recorded by Manetho. King Ramses III in an address to his soldiers says:

"The land of Egypt had fallen into a state of ruin, and every man did that which it seemed right for him to do, and for very many years the people had no chief governor who was able to maintain dominion over the others. The land of Egypt was in the hands of governors of the nomes, and among the nobles and lords of the land one killed the other. There came a period after that of years of want and great misery, and Arsu the Syrian made himself prince over them. He placed the whole country under tribute to him, and each man gathered whatsoever he could for himself, and plundered the property of others, and they treated the gods in this manner likewise as well as men, and the sacrifices which ought to have been

made to the gods in the temples according to law were never offered up at all. Then the gods overthrew those men and brought peace into the country, and they made the country to be what it ought to be, and fashioned it according to what was right. And they established their son who had proceeded from their members to be the prince of every land which was under their throne. Rausrkhausetepnrameramen, son of the sun Setnekht-nerer-Ramerer-Amen. And he became like Khepera Set when he burneth with wrath and rageth, and he provided with all things the land which was in a condition of revolt and misery. He slew all those who were disloyal in the land of the inundation, and he purified the great throne of Egypt. He became the sovereign prince of two lands upon the throne of the god Tem. He gave himself to a reconstruction of the things which had fallen into a state of decay, and at length every man regarded as his brethren those who had been divided from him as by a wall. He established the temples and provided them with divine offerings, and men made the offerings which they ought to make unto the company of the gods according to their ordinances.

"He raised me up as heir to the throne on the seat of the earth-god Seb, to be the great governor of the Egyptian dominions in care of the whole people who have found themselves united again.

"And he went to his rest out of his orbit of light like the company of the celestials. The rites of Osiris were accomplished for him. He was borne in his royal boat over the river, and was laid in his everlasting house on the west side of Thebes.

"And my father Amon the lord of the gods, and Ra and Ptah with the beautiful face caused me to be crowned as lord of the land on the throne of my parent."¹

That this speech of Ramses III and Manetho's account describe the same events is quite evident. The confusion and desolation of Northern Egypt, the cessation of temple worship, and temporary predominance of Osarsiph, or Arisu, the restoration of order by Setnekht, followed by his admission of his son Ramses to important public stations, are in strict accordance with Manetho.

Ramses III to whom the above address is ascribed, was one of the most famous of the Egyptian kings. He

¹ *Vide* Budge, *Hist. of Egypt*, Vol. V, 145; and Brugsch, *Hist. of Egypt*, Vol. II, 143. In the latter part I follow Brugsch as less technical.

well deserved the promotion awarded him in his youth, mentioned both by him and Manetho. His reign revived the glories of Thotmes III and Ramses II. He repelled the Lybians and northern invaders, and successfully invaded Palestine and northern Syria. The inscription on the east face of the great pylon of Medinet-Habu shows the numerous cities reduced under his control, and gives minute though not now thoroughly comprehended information respecting the geography of Palestine before the occupation of the Israelites. The above quoted Sallier Papyrus shows him, in its other parts, as a devout worshiper of the gods, and contains inventories of his rich and varied offerings. Such profusion of wealth, gathered from the spoils of foreign countries and the revenues of a well-ordered state, gained him the reputation of being the wealthiest of all kings. As such Herodotus mentions him, calling him the wealthy and miserly king Rhampsinitus. Brugsch shows that at home he bore the title of *Ramessu pa nuter* (Ramses the God), from which the Greeks derived the name found in Herodotus and Diodorus.

His father Setnekht thus appears as the Pharaoh of the time of Moses. But the name Setnekht is not that given by Manetho, who calls the father of Ramses by the name of Amenophis. How does this discrepancy occur? Neither Ramses III nor any other Ramses was the son or immediate successor of an Amenophis. If we compare the succession of sovereigns of that period as stated by Manetho, with the monuments, we find some confusion. The monuments show the following list of kings of the XIXth Dynasty:

- Ramses I.
- Seti I.
- Ramses II. (Reigned 66 years.)
- Merneptah I.

Seti II.

Amunmesu.

Sipthah.

The XXth Dynasty begins:

Setnekht.

Ramses III.

Ramses IV, and so on with kings named Ramses to the end of the dynasty with XIII.

Manetho's list of the XIXth Dynasty is:

Sethos.

Ramses (Reigned for 66 years.)

Amenepthes. (Reigned for 20 years.)

Ramses. (Reigned for 60 years.)

Amenemes. (Reigned for 5 years.)

Thuoris or Polybos. (Reigned for 7 years.)

He begins his list of the XXth Dynasty with Nekepsis, and it only contains one king named Ramses, instead of thirteen, and names a series of other kings not found on the monuments.

Manetho is substantially correct in his statement of the length of the reign of Ramses II. It was sixty-seven years. He may be correct in that of Amenepthes or Merneptah, his son, though the highest monumental number of the latter is eight. He follows Merneptah with another Ramses reigning sixty years—evidently a repetition. So treating it, we find the successor of Merneptah, according to Manetho, to be Amenemes. This king was probably the Amunmesu of the monuments, but as he appears in Manetho as the immediate predecessor of Thuoris (whom we shall find to be Ramses III), it is most probable that he is the person whom Manetho calls Amenophis. Manetho in one place calls him Amenophis and in another, Amenemes, thus presenting them both as the father of Ramses III. We can only rely on Manetho when he can be reconciled with the Sallier Papyrus. That document represents Setnekht as the father of Ramses III, and

shows that they cooperated in restoring peace after the disorders occasioned by Arisu.

The name Osarsiph is given by Manetho. Birch and Eisenlohr read it Aarsu. Brugsch makes it Arisu, or Alisu, or Alius. Budge reads it Arsu. It may be read Osarsiph. The best reading now practicable is Iarsw. The papyrus calls him a Khar or Khal. This term translated by Brugsch, Phœnician, was applied not merely to that people, but also to the Semitic population extending from Tōnis to Aupa in northern Syria.² Manetho says that Osarsiph was a priest in the temple of Osiris at On. This does not necessarily imply that he was a member of the sacerdotal class. There were lay priests in the Egyptian temples, who alternated in the care of accounts and revenues.³ They had good opportunities of learning whatever was taught. Of such a scholar it might well come to be said that he knew all the wisdom of the Egyptians.

On (Heliopolis) was a seat of learning to which in after centuries, Greek students repaired. There Pythagoras studied under his master Oinuphis. There Amenophis IV had founded, within a century before Moses, a temple to Aten the god of a peculiar monotheistic worship, hostile to that of the Egyptian gods.⁴ Osarsiph could not have been ignorant of this religion, and he exhibited even a fiercer hatred of the gods of Egypt than was shown by the heretic king. The same spirit was shown by Moses when Aaron set up an image of the Egyptian god Mnevis.⁵

Some confusion has arisen from the fact that Manetho represents Amenophis (Amen hotep) as consulting a

² Brugsch, *Hist. of Egypt*, Vol. I, 256.

³ *Zeitschrift für Aegyptische Sprache*, XL, 113.

⁴ *Idem*, 112.

⁵ The relations between Hebrew monotheism and that of Amenophis IV have excited much discussion, but are imperfectly understood. Both were exclusive. Breasted in *Zeitschrift für Aegyptische Sprache*, XL, 106.

prophet of his own name, the son of Papi. Amenophis III really had a renowned chancellor, Amenophis the son of Hapi. The impossibility of regarding the Exodus as occurring in the reign of Amenophis III or his successor Amenophis IV has led some Egyptologists to deny that the account of Manetho has any reference to the Hebrew Exodus. To suppose, as Edward Meyer does, that the Egyptian historian had in mind only the religious schism of Amenophis IV is to discredit both Manetho and the Exodus account, and relegate the whole subject to the realm of unintelligible myth. As well take the position of Dr. Inman, who maintains with great earnestness that the Jews never were in Egypt.

The confusion seems to have its origin in the fact that there was at Memphis a temple of Amhotep, the god of prophecy, whom of all others Setnekht, a Memphite man desirous of knowing the future, would be most likely to consult.

When did the Exodus occur? Evidently during the latter portion of the reign of Setnekht; that is to say, a short time before that of Ramses III began. Dr. Mahler, the principal authority on Egyptian chronology, fixes the year 1240 B. C., as the first year of Ramses III.⁶ Bunsen has shown that Hebrew chronology throws only a feeble light on the question.⁷ The irreconcilable statements of the received text, the Septuagint, and Josephus, and the doubt which of the Judges are synchronous, throw the matter into confusion. One gleam of light is visible. There were between Aaron, who was the high priest at the time of the Exodus, and Zadoc, who anointed Solomon B. C. 1010, eleven high priests succeeding each other

⁶ *Zeitschrift für Aegyptische Sprache*, XXXII, 102. Mahler's conclusions are regarded as substantially correct for dates not earlier than the XVIIth dynasty.

⁷ *Aegypten's Stelle in der Weltgeschichte*, I, 218. The subject is exhaustively treated in IV, 320.

by the law of primogeniture. Taking twenty-two years, the average length of the reigns of hereditary monarchs, as a criterion, their administrations would fill a period of two hundred and forty-two years, or only ten years more than the interval between B. C. 1010, and 1242. This estimate, however unreliable as to the exact numbers, is sufficiently near the truth to discredit the period of four hundred years of the received text, (440 of the Septuagint) given as intervening between the Exodus and the building of the temple, and to indicate approximately the correctness of the date above given.

Ramses II is recognized by most Egyptologists as the Pharaoh of the persecution. He it was who built, or at least greatly enlarged the cities of Rameses and Pithom, and imposed severe labor on the Israelites. Impressive as anything in the Book of Exodus, is a sentence in the dialogue between him and Ptah in respect to the great temple to that god which he built in Memphis. The king says:⁸ "I brand with a hot iron the foreign peoples of the whole earth. They are thine forevermore." This king ascended the throne B. C. 1347, at the age of 20 years and reigned 67 years, or until 1280. The above inscription is of the 35th year of his reign, and commemorates the completion of the temple. He had a large family of children by wives and concubines. Among the daughters was a younger one,—the Princess Meri. It cannot be far out of the way to assume that she was a grown up girl at about the date of the above inscription. Eusebius says it was she who found the infant Moses. The birth of the foundling was probably not far from this date, or B. C. 1312. At the accession of Merneptah in 1280, he would thus have been thirty-two years old. At the period of the Exodus, 1242, he would have been seventy. The Exodus account says he was eighty.

⁸ Brugsch, *Hist. of Egypt*, II, 90.

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Merneptah succeeded Ramses II. His oldest monumental year is the eighth. The principal event of the first part of his reign was a great invasion from the west, occurring in his fifth year and triumphantly repelled. There is preserved an official account of this invasion, and also a hymn of triumph. The latter mainly celebrates the victory over the Lybians, but contains a verse that is sometimes cited as proof that the Israelites were in Palestine at the time. As translated by Spiegelberg it reads:⁹ "Wasted is Thnw: Cheta quieted: Canaan with all the vile seized: Gezer captured: Jenoam brought to naught: Israel devastated and its crops destroyed: Hor has become like the widows of Egypt. All lands are at peace." The countries named are Lybia; Cheta (the country of the Hittites); Canaan, the lowlands of the coast and of the Jordan Valley; and Hor, southern Palestine. Beside these, four cities are named: Askalon, Gezer, Janoam and Israel. The first two are well recognized. "Janoam" is probably the Janina of Josephus, the *Jabne-el*¹⁰ of the Hebrew text, and "Israel" is *Jezre'el*,¹¹ lying to the north of the others. The hymn may contain an allusion to their names, for it appears that the first which claims to have been built by God is brought to nothing, and the harvest which God has sown is devastated.¹² The language of Palestine was not unfamiliar to educated Egyptians, as the Tel el Amarna tablets show. The hymn probably commemorates incidentally some expedition which brought those four cities into subjection,—an exploit magnified into an establishment of authority throughout Syria. There is nothing to show that the Hebrews were in Palestine in

⁹ *Zeitschrift für Aegyptische Sprache*, XXXIV, 14.

¹⁰ יבנה

¹¹ יזרעאל

¹² "Jabne'el, "God has built." *Jezre'el*, "God has sown." A similar word play is found in the next sentence, "*Khar* (Syria) has become like the *khart* (widows) of Egypt."

Merneptah's time. If there in the fifth year of his reign, after forty years of wandering, they must have left Egypt, at latest, when Moses was a child, and in the midst of the prosperity of Ramses II.

Merneptah was succeeded by his son Seti II, whose highest monumental year is the second. As to what happened in Egypt after the death of Seti II we know little from any other source than the Sallier Papyrus. Siptah, a son of Seti II, with his queen Tauser appears, and another king, Amennesu, followed by Setnekht. It is supposed that the two former were rival claimants of the throne, whose conflict was the beginning of anarchy. The Sallier Papyrus shows that there were three periods:

1. A considerable period of anarchy such as would naturally occur during a disputed succession, different nomarchs engaging in feuds at will, without restraint from any central power.

2. A period of scarcity during which Arisu raised himself to power and spoiled the Egyptians, and insulted their gods. In the Exodus account, this period of scarcity is treated as one of various miraculous plagues.

3. The establishment of the authority of Setnekht, who punished the guilty and brought in prosperity.

Arisu, who was the ruling spirit during the later anarchy, had, according to Manetho, attained priestly accomplishments, and according to the biblical account, became versed in the wisdom of the Egyptians. According to Josephus, he had also a large military experience, having been commander in a war against Kush, or Nubia. Brugsch discovers a certain Mas who was viceroy of Kush in the latter part of the reign of Ramses II, and in that of Merneptah. The Exodus account represents him as escaping by flight the penalty of homicide, while Josephus adds a court cabal against his life. After a lengthened absence, the general disorder rendered his return safe.

Times of turmoil bring oppressed classes to the front, and men of capacity and energy assume their leadership. This man of tremendous capacity and energy became a leader, and conducted his people out of Egypt. Their departure was at last a precipitate retreat. Smoke signals by day and fire signals by night furnished information to the pursued of the motions of their pursuers. A beach bared by a strong wind afforded a passage, and the reflux waves checked pursuit with serious loss to those who followed carelessly. The pursued rejoiced that Jehovah had saved his chosen people from destruction; the pursuers, that their gods had freed their country of a dangerous element, though prohibiting pursuit beyond the frontier.

Ramses III entered on a long and prosperous reign of thirty-two years. He made several campaigns in Palestine and Syria, and fully restored the authority of Egypt. In these campaigns he found no Jews in Palestine. His march was not confined to the coast country. Hebron, Jerusalem and the cities of Moab were brought beneath his power, as well as the cities of the coast. He is said by Maspero to have introduced the Philistines to the region thereafter occupied by them. If his garrisons had occupied southern Palestine when it was reconnoitered by the Hebrews, their dismay and retreat are readily explicable. At any rate, no entrance into the west Jordan land could be attempted during his life, or probably during that six years reign of his son Ramses IV.

Under Ramses V, anarchy broke out again in Egypt. There was a conflict between ecclesiastical authority, vigorously maintained by the high priests of Amon, and civil authority, feebly maintained by short-lived kings; between Upper and Lower Egypt, which differed slightly in people and dialect; perhaps an economic reaction against the heavy taxation and profuse expenditure of the reign of Ramses III, like that in Judea under Rehoboam. It was

a fatal blow to the prestige of Egypt. The forty years of power of the Egyptian kings after the departure of the Hebrews toward the close of Setnekht's reign, and the anarchy which succeeded these forty years, explain why the Hebrews were forty years on their migrations. When that forty years closed, Egypt became, as to foreign influence, a mere cypher, and so remained for about two centuries. Joshua met with no opposition from the Egyptians. The impotence of the ruling country had given independence to every city and district. There is no evidence that the Jewish conqueror thought of the Egyptians while subduing the thirty-one kinglets who severally or in small combinations opposed him; no evidence that any considerable body of Egyptian troops passed out beyond the ramparts of Migdol before the time of Solomon.

Manetho represents the Jews as a collection of the diseased and leprous population of Egypt,—a view absurd in itself, since such a community would soon have become extinct,—and greatly resented by Josephus; but probably having a foundation in the religious ideas of the Egyptians. Inscriptions of Merneptah and Ramses III show that in counting their slain enemies, the circumcised and uncircumcised were separately enumerated. All uncircumcised persons were impure. It is probable that great numbers of those who left Egypt with Moses were uncircumcised, and therefore impure. The growth of national hatred in later times exaggerated this technical impurity to the frightful extent appearing in Manetho's narrative. It is true that this view of the non-circumcision of the departing Jews is expressly contradicted by the received Hebrew text, which says: "Now all the people that came out were circumcised, but all the people that were born in the wilderness by the way as they came forth out of Egypt, them had they not circumcised." (Joshua v. 5.) But the Septuagint gives an entirely different account.

It says that Joshua circumcised whosoever were born on the way, and whosoever of those that had gone out of Egypt, were uncircumcised. And again: "For most of the fighting men who went out of Egypt, were uncircumcised."¹³ The text which the Greek translators had before them is likely to be more correct than our received version. The great medley¹⁴ that went up also with them, (Ex. xii. 37) were probably other foreigners reduced to servitude in the Delta. If this view is correct it is readily seen how the Egyptians would brand as impure a community containing a large percentage of uncircumcised persons; and not practising the rite for forty years. Its renewal by Joshua at Gilgal "rolled off the reproach of Egypt" from his people.

Classic authors confirm the Hebrew and Egyptian accounts, and afford an invaluable synchronism. Pliny speaks of "Rhameses quo regnante Ilium captum est." To which of the numerous kings named Ramses does he refer? A reference to Herodotus answers the question.¹⁵ That historian relates that Paris came to Egypt with Helen just before the Trojan War, and found there a king whose name in the Greek language was Proteus. He goes on to relate that Rhampsinitus was the son of Proteus. As Rhampsinitus is certainly identified with Ramses III, Proteus is thus identified with Setnekht. That which is a necessary inference from the language of He-

¹³ The Hebrew text is:

כי מלים היו כל העם היענים וכל העם היזרים במדבר בדרך כציהם ממצרים לא
קרו

But the Septuagint says:

Ὅσοι ποτὲ ἐγένοντο ἐν τῇ ὁδῷ καὶ ὅσοι ποτὲ ἀπερίτμητοι ἦσαν τῶν ἐλληνισθῶτων ἐξ Αἰγύπτου πάντας τούτους περιέτεμεν Ἰησοῦς.

and again:

διὸ ἀπερίτμητοι ἦσαν οἱ πλείστοι αὐτῶν τῶν μαχίμων τῶν ἐλληνισθῶτων ἐκ γῆς Αἰγύπτου.

The translators had no such text before them as that of our received version.

¹⁴ ערערב ἐπιμίκτος πολλός.

¹⁵ Herod. II, 112.

rodotus, appears clearly stated by Diodorus, who says (Diod. Sic. I, 62):

"After this king (Mendes), anarchy occurred for five generations. One of the obscure men was chosen king whom the Egyptians call Ketena, but among the Greeks he seems to be Proteus, who lived during the Trojan War. What the priests say of him agrees with what is handed down concerning Proteus' acquaintance with spirits and changes of form; for they say that from association with astrologists, which he held continually, the king had acquaintance with such matters; and that the Greek fable concerning changes of form was derived from a usage handed down among Egyptian kings, that the rulers of Egypt should wear on their heads, faces of lions, bulls and dragons, emblems of authority: and sometimes trees, and anon fire, and sometimes many agreeable spices; and thus they array themselves for ornament or for inspiring astonishment and superstitious feeling. After the death of Proteus, Remphis his son, inheriting the kingdom, spent his whole life in attending to his revenues and amassing wealth from every source."

Lepsius identifies Ketena with Setnekht, and there can be no mistake in this. But why did the Greeks call him Proteus? The noun Proteus,¹⁶ like most nouns terminating in *eus*,¹⁷ denotes a member of a class. It is derived from *protos*,¹⁸ and points to a class of which each member is a first man. To only one Egyptian king, Menes, could the word *protos* be applied, but every first king of a dynasty was a *Proteus*, and Setnekht was the first king of the twentieth dynasty. Herodotus and Diodorus speak of him as a parvenue, and he seems from a careful examination of his tomb, to have appropriated that of King Sipthah and his queen Tauser to his own use, which would not have happened had he been in the line of legitimate succession.

The Odyssey represents Menelaos as visiting Egypt after the capture of Troy, and mentions among his wealth articles of value given him by Polybus and his wife Alcandra at their house in Thebes. It is not expressly stated

¹⁶ Πρωτεύς.

¹⁷ ὡς ἀλφειός, λερετός, βραβεύς, ιππέυς.

¹⁸ Πρώτος.

that Polybus was king of Egypt, but as he entertained a king and gave kingly gifts, the presumption arose that he was himself a king. Syncellus speaks of him as "Thuoris, called Polybus by Homer, in whose time Ilium was taken." These names are not Egyptian but Greek, and point to Ramses III. The word *Polybos*, as Eustathius explains, means wealthy. Thuoris¹⁹ is in some manuscripts *thures*²⁰ and seems to be a slightly varied form of *thyoros*²¹ a sacrificant, or preparer of sacrifices. These epithets fit the wealthiest of kings, whose unprecedentedly great sacrifices to Amun are enumerated in the Sallier Papyrus, and surpass those of all other kings ancient or modern.

Setnekht was on the throne immediately before the Trojan War, and Ramses III when Troy was captured. The capture then occurred early in the reign of the latter king. If Mahler's computation of the reign of Ramses III is correct, the city fell between B. C. 1240 and 1235. That it was near the former date is probable. Herodotus, writing about B. C. 443, says that the capture of Troy occurred eight hundred years before his time. A scintilla of evidence in the same direction is found in the Odyssey.²² Odysseus tells Eumaeus of his feigned adventures as follows: He returned to Crete with Idomeneus at the close of the Trojan War, and there fitted out a predatory expedition to Egypt. Recruits flocked to him and filled his ships at once. What more plausible, when there were so many disbanded veterans of the war? The invaders landed on the Egyptian main, and were in the full tide of plunder, devastation and enslavement of captives, when the king of Egypt arrived. The disguised hero describes the terrors of the Egyptian array, the rout and slaughter of the marauders, and how he crept to the king's knees and obtained mercy. Though it was but a feigned tale, it could only obtain credence by connection with some known fact.

¹⁹ θουώρις.²⁰ θούρης.²¹ θυώρος.²² XIV, 305.

Now in fact there occurred in the fifth year of Ramses III, an invasion of Egypt by the Lybians assisted by northern peoples. That Greeks participated in the invasion is proven by the representation at Medinet Abou, of Ramses III smiting the Danana (the *Danaoi*²³ of Homer) with his battle-axe. Among others of his opponents are mentioned the Leku or Lycians, whose connection with Crete is well known,²⁴ with others whose identification is less reliable. The naval power and piratical habits of the Cretans make it extremely probable that they engaged in expeditions against Egypt of the kind described by Homer, and that the idea of such an expedition occurring soon after the Trojan War, was familiar to men who lived in Homeric times.

The above synchronisms enable us to form an estimate of the period of the Exodus. Egypt was at the height of military, financial and literary splendor, but verging on decline. The scattered communities of Hellas had come to a consciousness of collective power, and united in a great undertaking. Though the thalattocracy of Minos had gone by, Cretan corsairs waylaid the paths of Phœnician commerce and ravaged the Egyptian coast. The Hebrews entered upon conflicts beyond the Jordan, and from a rude horde of emigrants, became a nation. It was a period of organization, of energy and of activity,—one of those periods that shine out in history, and are followed by times of dullness and obscurity. Such a period appears in Egyptian, Greek and Hebrew history. The time of the later Ramessids in Egypt, of the Judges in Palestine, of the age succeeding the Trojan War in Greece, remind one of the Merovingian and later Carolingian eras in France.

In such active periods not only does history flourish, but myths arise. How fruitful the Trojan War has been of the latter need hardly be alluded to, but this discussion

²³ *Δαναοί*.

²⁴ Hoeck, *Kreta*, II, 337.

cannot be closed without reference to the Greek myths about the Egyptian king Proteus. As early as the time of Homer, the mythical character of the old man of the sea was attached to him.²⁵ He came with the flock of Poseidon from the watery depths, to take his daily repose on the isle of Pharos, off the Egyptian coast. Menelaos under the direction of Eidotheia, seizes him, and notwithstanding his struggles and changes of form into a lion, a dragon, etc., holds him and compels him to prophesy. Historical features show dimly through this atmosphere of fable. Here is a reminiscence of the changeful Pharaoh of Exodus,—the Amenophis of Manetho,—timid, superstitious and addicted to vaticination. But the feature of submersion in the sea is most prominent. It does not appear either in the Hebrew or Egyptian accounts, that the king perished in the sea, nor does Proteus seem to have been the worse for frequent submersion.

The myth related by Tzetzes presents us with Proteus as an Egyptian king, son of Poseidon, who went to Thrace and there married Torone. His sons by this marriage were undutiful, and he prayed to his father Poseidon to carry him back to Egypt. The great god of ocean led him back to Egypt by a miraculous tunnel beneath the sea. Here again is Setnekht, absent, returning; submerged, triumphant. His mythical family are instructive. As in the *Odyssey*, he had a daughter Eidothea,—one who sees God,—so in the other myth, he had a daughter Theonoe,—one who knows God. The aspiration of Manetho's king was to see the gods. He had an elder son Tmolus, slain by Hercules, and also a younger son Teligonus,—later born. The first born son of the Pharaoh of Exodus died, and the epithet Teligonus would fit Ramses III. The name of another son Polygonus seems an epithet appro-

²⁵ *Odyssey* IV, 365. The myth of Proteus is much like that of Nereus.

priate to Ramses III. He was *Polygonos*,²⁶ prolific—as appears from his eighteen sons, several of whom reigned, and his fourteen daughters. Another son was Theoclymenus—renowned god,—which seems an attempt to translate his title of Ramses-pa-neter. We can see in these myths, as in history, the features of the superstitious, timid and vacillating king, and his illustrious son, with a prominent idea of submersion without harm in the sea.

The vault of Deir el Bahri has given up the body of Ramses III. Lauret has found that of Setnekht, and the faded lineaments of him whom Moses saw in the field of Zoan, meet the eyes of the men of the twentieth century; but Moses was buried obscurely, and “no man knoweth of his sepulchre until this day.”

GEO. W. SHAW.

GENESE0, ILL.

²⁶ Πολυγόνος.

THE SOUL IN SCIENCE AND RELIGION.

AMONG all questions, theoretical as well as practical,—philosophical, scientific, ethical, and those of everyday life,—the problem as to the nature of the soul stands foremost in importance. For it is obvious that whatever we do, the conception of ourselves will always be the ultimate principle from which all other questions will have to be viewed and it is noteworthy that a great part of mankind exhibits on this very topic a peculiar anxiety as if the fate of their welfare depended on the decision of some general theory.

The nervous excitement which is prevalent in many circles can be traced with special clearness in the transactions of the Society for Psychical Research, the work of which is vigorously carried on, on both sides of the Atlantic, in England and the United States. The aim of the Society is most praiseworthy, and the result will be good in so far as it will contribute its share to clear up the situation. The leaders are both earnest and honest, and yet it is to be feared that the evidences in favor of post mortem communications and kindred occult phenomena will prove disappointing. The main result will be negative. Negative results, however, may be just as important and beneficial as affirmations, for they cut off useless speculations, and by limiting the field of investigation, help to make our positive theories more definite. Therefore even if the result will finally and definitely be found to be purely

negative, the labors of the society could by no means be looked upon as useless or redundant, and so we feel grateful for the work accomplished, although our attitude is necessarily critical.

The main fault in the methods employed by the Society for Psychical Research appears to be that most of its members show a tendency to seek for the solution of the soul problem in abnormal phenomena which offer at best merely distorted pictures of normal conditions. But there is an excuse for their procedure. We are so accustomed to normal conditions that we appreciate the psychical significance of our soul life more forcibly when we observe variations of certain familiar features in the abnormal shape of some grotesque pathological phenomenon. Yet there is this danger, that if the main fact is veiled by complications it leaves a greater play to our imagination and so pleases mystical and fantastical minds. But upon the whole it may be claimed that abnormal facts of soul life, so far as they are truly facts, reveal nothing more wondrous as to the nature of the soul than what is contained in normal soul life.

Among the different schools there has always been a rivalry between materialists, so-called, and spiritualists; the former claiming that the soul is a mere function of matter and accordingly without permanent significance, while the latter regard spirit as real, and for this reason would insist upon the reality and permanence of soul life. There is no need here of entering into a philosophical discussion of the subject and we would only point out that the issue has been greatly confused by lack of precision in the use of terms. The point which the so-called materialists insist upon is true enough in the sense in which they mean it. Nothing is real in the sense of "actual" or "thing-ish" except that which is corporeal. This statement, however, is simply a tautology, for real is derived from *res*,

"thing"; as actual is that which can act and is endowed with energy. But if we mean by real that which is efficient, in other words that which enters as a factor in the chain of causation, we will understand that the relational or the purely formal, which is non-material, is even more important in the real world of things than either matter or energy. The direction of a movement is the main thing on which the result in a special case depends. It is of the greatest consequence whether or not a rifleman takes the proper aim, while it is comparatively insignificant from what source (dynamite, powder, or compressed air, etc.) he derives his propelling force, or what may be the material of his projectile. The Greek accordingly called the immaterial element, "cause-like" or "causative,"¹ commonly translated "formal."

For this reason both materialism and spiritualism have never played any significant part in the history of philosophy and science except in circles of dilettantish thinkers who formulated their materialistic doctrines in contradiction to some mistaken views as to the nature of spirit. Materialists propose to explain everything from matter and energy or matter and motion and forget that matter and energy explain nothing, and being mere generalizations of a very abstract nature are quite unfit to explain anything. They are purely descriptive terms of certain universal qualities that all objects (things of objective reality) have in common. On the other hand spiritualists rightly correct materialism when they insist on the reality of spirit; but to be just we grant that there is a certain justification for the materialist's criticism of spiritualism in the materialistic conception of spirit which prevails among the spiritualists proper. A large class of people materialize spirit. Not unlike their adversaries, the materialists, they cannot imagine that any thing non-material

¹ τὸ αἰτιώδες.

is of actual efficiency, and so they change spirit into what is commonly called ghost. Spiritualists, so-called, have a wrong and crude notion of soul, conceiving it as a material entity, as if it were a bodily being made of some sublimated substance, air or ether or perhaps an unknown material. That they think of the soul substance as very ethereal is, theoretically, of very little importance, for it remains nevertheless a substance, and so spiritualistic theories become practically a psychical materialism. Matter remains matter, be it ever so attenuated, for even ether is a material substratum, and if the soul consisted of ether it would be just as surely corporeal as if it were made of denser substances such as bones and flesh.

As to man's anxiety to prove that the soul is spiritual and not material, we would say that the common facts of every-day life are sufficient evidence against materialism, and among them that wonderful phenomenon, consciousness, stands forth in its undeniable pre-eminence. Consciousness is not composed of matter, nor is it energy. It belongs to another category; it is *sui generis*. Consciousness is an intense state of feeling, and feeling is neither matter nor motion. It does not belong at all to the realm of objective reality, it is subjective. All objects are things, and objectivity manifests itself as matter in motion. The existence of consciousness indicates that objective reality is merely the exterior of existence, and that there is an interior, the existence of which is an undeniable fact and not merely a problematical theory. Though the subjective and objective are contrasts, they are not necessarily different nor are they unrelated; they are closely interlinked and the simplest solution which explains all difficulties is to view both as phases or aspects of one and the same reality. They are two sides of one fact, and, though if we take our stand on one side the other always appears as purely

phenomenal, we have sufficient reason to insist on the reality of both.

But few words may suffice to explain what we mean by subjective and objective.

If we consider our experiences as they are in themselves we will be forced to admit that every one of them consists of feelings or sets of feelings. What we call "objective" is first given us as a system of sensations from which as an ideal inference we construct the material world, and so the most materialistic world-conception is ultimately a mere conclusion (or even an assumption) based upon sense-impressions. If we analyze our world as much as we may, we can never quit the circle of sentiments, sensations and ideas. Our entire being is built up with them and what we designate as actual is really an idea.

On the other hand we must grant that all the experiences of our mental life present different forms of sense-impressions, and these different forms are pictured as bodily existences surrounding us in space. Our space conception represents the distance to be traversed to reach the point under consideration, and the feasibility of these practices, well established by experience, justifies the general scheme of this method of viewing the world as things or bodily objects moving about in space. Our conception of matter corresponds with the sense element in our experiences. It means resistance felt, and thus it describes the most general feature of sensations. It is that which somehow touches (or is capable of touching) one of our organs of sense, that which opposes (or is objected to) the subject.

For all practical purposes we can eliminate the psychological condition which is presupposed when speaking of matter, and in the same way the geometer can make his measurements and calculations without minding the psychological facts upon which his space conception is built. Scientists may treat matter, motion and space as definitely

given data, and as long as they have phenomena of the objective world under consideration, that is, so long as they contemplate bodies in motion, they will encounter no difficulties either philosophical or psychological. They eliminate for their special purpose the psychological phase of existence; and so the objective world will appear to them as real, while feeling will be a mere spook, a ghost, a transient guest within their range of inquiry that may well be disregarded.

It is obvious that for philosophical purposes neither a purely objective representation nor a purely subjective description of life will be satisfactory. We need both and must harmonize both. Though for certain investigations either standpoint may be negligible, we must never forget its actuality. Under all circumstances one fact stands out most prominently, and that is the spirituality of the world. Consciousness cannot be an accidental phenomenon of life, but must be an integral feature of it. The prevalence of potential consciousness which we call subjectivity is an inalienable quality of existence, and therefore we are assured that consciousness does not make its appearance simply on account of a strange haphazard formation, but it must develop with necessity according to the intrinsic constitution of the universe.

It is even probable that the potentiality of consciousness implies a tendency towards realizing it. We speak figuratively of an affinity among chemical elements and grant it to be a mere figure of speech; yet the simile may be truer than philosophers imagine. It would be fantastic to look upon inorganic nature as endowed with feeling, and yet we must grant that there exists in it some subjective state analogous to the feeling of sentient creatures, and we may look upon it as a lack of equilibrium with the rest of the universe, implying the tendency of readjustment.

Let us assume that there is such a thing as undifferentiated existence, which we will call world-stuff or ether. If a differentiation set in, it might show itself in little whirls or centers of subjectivity. A differentiation is not an isolation and so the interaction with the surrounding universe continues. Experience teaches us that all atoms are animated by a universal attraction called gravity and also that different kinds of atoms (presumably according to the geometrical form of their inner conformation) possess the tendency to combine themselves in more and more complicated groups. The most wonderful combinations are those which are most unstable, possessing at the same time the property of renewing themselves. This round of changes which constitutes the most characteristic feature of life is called metabolism.

Life accordingly is a process due to the tendency of organization. It consists of the functions of building up, breaking down, and renewing. Elements combine into a higher union in which some energy is stored up,—a function called anabolism; thereupon the energy is set free in motion which causes a breakdown of part of the structure called katabolism. Both together constitute metabolism.

If we try to view the actual facts of life under *a priori* considerations we may well grant that isolated feelings would be mere states of irritations, they would not become conscious, for though they might feel, they would not be felt. In order to be felt, feelings must be organized into a system of interacting feelings, in which different feelings are contrasted, classified and intensified. This is exactly what takes place in the nervous system of animal organisms, and we may very well credit this final outcome to a certain hunger for organization, which is naturally present in all primitive existence as the main need of its subjectivity.

We are so accustomed to consciousness that its marvelous existence no longer strikes us, and so its significance is brought home to us more strongly in the abnormal phases that it assumes in pathological conditions. But after all consciousness is sufficiently evidenced in our common every-day experience, even though we are apt to overlook it because through sheer habit we have become callous to its existence. Let us but once become fully cognizant of what the existence of consciousness means and we shall no longer feel obliged to hunt for evidences of the spirituality of the world in pathological domains.

The same is true of sundry other facts. For instance, investigations have been made to prove an abnormal and miraculous kind of telepathy in order to exhibit the power of mind, and yet the daily fact of sensation which takes place in the experience of every one is properly speaking a phenomenon of telepathy. We do not mean telepathy in the absurd and disfigured sense of the word in which it is now used, that we can know or notice something without any means of communication, but in the literal sense of the word which means "perceiving at a distance" and in this sense every sensation is telepathic.

For instance, our eye receives a slight light-impression and thereby we perceive the existence of a star which is so far off that its light must travel many thousand miles before it reaches our earth. Our perception of the starry heavens is perhaps the most striking instance of the telepathy of our organ of sight, but our sensations of touch are not less telepathic, for the miracle is the same in either case. The object of touch is as much outside of us as the most distinct star and its presence is felt within the sentient subject, and strange to say the sentient subject conceives the existence of the perceived object to be outside. This inside perception of things outside, is telepathic in its very nature; and our entire world of thoughts, too, is repre-

sentative of objective existence, which means that it pictures things subjectively that possess (or are thought to possess) objective reality. They are felt in the mind and they exist in the surrounding world—yes, our mind is capable of extending its knowledge even to distant times. It can reconstruct the past, it can forecast the future, and so we are justified in characterizing the mind as a telepathic instrument.

When we consider the relative significance of form and matter, we will soon learn that matter is of little importance, while the form makes the thing what it is. From this point of view the ancient Greek philosophers looked upon the form of an object as the essential feature of the thing, and the material of which it was made as accidental. A statue, according to Aristotle, exists first of all as an idea in the artist's mind. Its existence as an idea (which means a picture, an outline, a mere form) is the beginning of its actualization. It is a potential existence, yet potential existence is not mere non-existence. When the artist chisels out the statue conceived in his mind the idea assumes actuality and the statue now manifests itself in material shape. Aristotle thinks of the thing as existing already in its potential state, and it is the idea that assumes materiality. In our days the average man would rather take the opposite view and speak of a block of marble as assuming the shape of a statue, as if the marble were the real thing and the statue an accidental quality of the marble.

It is obvious that the ancient conception is more correct. The essential feature of anything that exists is its form. The material is indispensable for actualization but it is after all of secondary consideration. If an artist has two blocks of Carrara marble of the same quality, one may be turned into a god and the other into a demon, and it makes no difference which block is used for either purpose. The character of the statue depends upon the form it re-

ceives from the sculptor's hand. A Raphael and a common dauber may buy their material at the same shop and it is a mere accident which tubes of paint each may obtain. The character, importance, and significance of their paintings does not depend on the material (canvas, paints or brushes) with which it is painted, but solely on the form in which the paint is fixed upon the canvas.

But the objection is made that there are different qualities of material. I may make a statue of gold, or silver, or marble, or of mere clay, and the value of the statue will vary greatly accordingly. But this objection proves again the significance of form, for what else is the distinction between the different materials? If our present scientific world-conception be true, we must take for granted that practically all our chemical elements ultimately consist of the same stuff, particles of which are grouped in different configurations with varying density and molecular construction in the different elements. So the difference between the chemical elements is after all one of form and not of material.

It is true enough that without matter or energy, forms would remain mere potentialities. In order to be actualized they must assume material shape and in order to be effective they must somehow be possessed of energy. Thus there is no actualization in the objective world without matter, motion, space and time. But the paramount importance of any thing after all is its causative or purely formal element. And this holds good with special force in the domain of spirit.

A thought which I think, is a state of feeling of a definite form, expressed in the domain of matter and motion as a cerebral commotion that causes the tongue to utter a series of words. The burden of these words is the meaning of the sentence. Now we distinguish between the form or contents of the thought and the state in which it is actu-

alized. The former is the idea, the latter a cerebral motion accompanied by consciousness.

The distinction between the state of thinking and the idea that constitutes the content of a thought, is rather subtle, and we cannot expect that the untrained multitudes will trouble themselves about these philosophical niceties. Nevertheless the distinction holds good and should not be neglected, for it implies more than we would expect. If we weigh the two we will see at once that the idea is more important than the state of thinking, for the thought as an act is transient while ideas are eternal.

All our thinking is truly a mere manifestation of the eternal potentialities of thought, just as man's rationality is an incarnation of the eternal principles of reason, or, as the author of the Fourth Gospel would say, of the *logos*. To us it is of paramount importance that we think the right thought at the right time. Hence we are naturally interested in the materialization of a good thought in our own brain. But after all the validity of the thought,—its thinkableness, its eternal possibility which constitutes its truth, its intrinsic validity and applicability, should be rated higher as being the presupposition upon which the worth of our own thinking depends.

Now we must bear in mind that man is a being of sense (and sense always is closely related to matter) and so it is not surprising to find that he is commonly materialistic. Being firmly convinced of the significance of the purely formal features of existence, man looks upon them as realities and represents them in his imagination as if they were concrete material entities. Thus the totality of causative factors viewed as the great formative principle of the universe is materialized into a concrete being, and assumes the figure of the highest individual that man is capable of imagining, which so far has been either the patriarch of the tribe or the monarch of a nation. Thus God, instead

of being considered as God, (i. e., a universal omnipresence whose existence is eternity and whose nature is infinitude), is conceived as an aggrandized human personality and is spoken of as "the Lord." The everlastingness of thought as truth is represented among all nations as a place. It is called the happy hunting-ground, elysium, aahlu, isles of the blest, heaven, paradise, nirvana, and represents in more or less materialistic imagery the eternal back-ground of our thought in which our very personalities will finally find their everlasting abode.

To the unsophisticated man these ideal conditions, or states of being, are purely phenomenal because he views them from the sphere of materiality in which his own life is so deeply rooted. He will declare them to be nonentities, or dreams, or mere bubbles of religious or perhaps philosophical imagination. Yet their result asserts itself in practical life and there are not a few among all the races of mankind who feel the power of things spiritual, and according to their intellectual capabilities they clothe them with the garb of poetic visions. This is the origin of religion and all that is connected with it. It gives rise to superstition, but if we beware of the fallacy of taking the poetic imagery of religious imagination in its literal meaning, we shall unhesitatingly grant that the religious emotions are perfectly justified upon philosophical grounds.

Religion is an instructive method of supplying mankind with truths which are beyond the reach of the multitudes, and the truth of any religion should not be judged by its literal dogmas but by their significance and ultimate purport.

As to the soul, the different religions have produced different conceptions, and we shall find that almost every one of them is adapted to the different conditions under which it originated. The Egyptian soul-conception now appears to us crude and pagan, but in its time it fulfilled

its purpose and offered comfort and consolation to the worshippers of Osiris in the hour of death. It also contained wrong notions which affected Egyptian life injuriously, but the superstitions might easily have been obliterated if the philosophical development of the people had been such as to gradually purify their religious life, and a similar verdict may be rendered concerning all other soul-conceptions. Every one of them has been instinctively thought out for the purpose of illustrating a truth which the people could not otherwise understand and which even by the leading spirits of the age was sometimes only dimly felt. And the Christian soul-conception of the present day likewise serves in its way a good purpose. But it can easily have injurious effects if the allegorical features are accepted too literally and thus obliterate the truth or lead to superstitious beliefs and practices. Thus the different religious soul-conceptions may be altogether wrong, yet they are in certain aspects *as if they were true*. They drive home a truth by a simile or parable and the only mistake of devotees is in taking the allegory of their dogmas seriously and letting the letter that killeth prevail.

We will not enter here into argument as to the nature of immortality which rightly holds an important place in all religions, but we will point out a contrast between two opposite truths; one is the permanence of all events, the other is their transiency. We must know that the bodily organism will be dissolved into its elements, and all its functions—its reasoning, its feeling and consciousness—will be gone forever; on the other hand it is undeniable that causes endure in their effects. Whatever man does will remain after him a living factor continuing to influence the world. The latter is as true as the former and constitutes the basis of man's belief in immortality.

Man instinctively feels that he cannot be wiped out in death and that the world will not go on as if he never

existed. His life, his personality, his aspirations and labors can not be lost, but must abide for time to come. This is a truth of obviously great significance, for it will influence our actions and will enter into our decisions as an essential factor.

Our life does not begin with birth nor does it conclude with death. It is only a section of the development of mankind before and after us. We existed before we were born and we reap what the factors of our being have sown. So our life leaves its after effects and they will be what we have made them. The man who lives thoughtlessly will be uninfluenced by any thought of the life to come, while the man who believes in immortality will (at any rate under certain circumstances) discipline himself so that his life will presumably be better or, let me say, more in correspondence with the demands of the universal development of all life. The truth is that while there is no immortality in the sense in which most religions hold it if we accept *their doctrines in their literal meaning*, conditions in life are such in many respects, *as if* these doctrines were true. For while our bodily existence is wiped out (as we have stated above) with all its physiological functions, the essential part of our own being—the thoughts themselves—remain; and thus our immortality (not as a concrete individual and bodily incarnation, but our soul, our character, the impulses which we have given in life to others, our aspirations and most characteristic features) can not be wiped out. A man who keeps this thought in his mind, either intuitively by realizing the power and justice of the religious instinct, or by having fathomed the problem philosophically in its very depths, will not live for the present moment, but in consideration of the after-effects which his life leaves on the world. And I would say that one of the best tests for right action in a critical situation, is for a man to ask himself, If I had

passed away from this life what would I wish that I had done in this emergency? I am confident that the answer given to this question would help us in the most difficult circumstances to find the right solution.

* * *

Several inquiries from readers of my writings concerning the exact nature of my belief in immortality have induced me to revert once more to this much mooted subject and add to my former expositions of the soul problem a few additional explanations. I cherished the fond hope that my treatment had been sufficiently clear and that my position had been lucidly set forth; but it appears that the middle ground which I occupy, combining the most radical position of unbelief with a sympathetic attitude toward belief and recognizing the truth which lies concealed in the allegory of religious doctrines, is puzzling to not a few thinkers who either would be ready to agree with my solutions without accepting my way of expressing them, or perhaps on the other hand would accept the formulation of my answer but attach to it a different, a religiously dogmatic, meaning.

As a matter of principle I limit the data from which I derive my conception to those facts that are of common experience and can be verified by the critical methods commonly called scientific. While I take note of different religious beliefs and so-called revelations, I do not propose to accept any one of the doctrines involved therein. I simply regard the existence of a certain belief as a notable indication of a corresponding psychical condition, viz., a human want and its satisfaction. Further I do not deem it proper to lay much stress upon statements of abnormal phenomena such as have engrossed the attention of the Society for Psychical Research. Their facts, like those of special revelation, are closely interwoven with theories

and can not be verified to the satisfaction of any one except the observers themselves or those who share their views.

The most important experiments which, if proved, would cause us to revise our scientific views, are mind transference without any means or vehicle of transmission (so-called telepathy) and intercourse with the dead, but both are of such a nature that they give ample room for self-delusion and fraud; accordingly we can scarcely expect satisfactory results of any kind. Here the work of the Society for Psychical Research has been most valuable. In spite of the enthusiasm of its members and in spite of their untiring energy as well as sacrifices of all kinds brought for their cause, the case remains *non liquet*. Nothing has been brought to light that could be used as scientific evidence, and wherever fully established, they only furnish us with facts which are as true as the normal phenomena.

We must bear in mind the rôle that accident plays in life; and one or two or even a few startling occurrences of a certain kind are insufficient as the basis for a theory that evolves far-reaching consequences as to the essential nature of the soul. We must further bear in mind that many, or even most, perhaps all, experiences admit of an interpretation that would make them reveal no other laws than can be obtained from an observation of normal phenomena. As to the subject matter of alleged communications from the dead, we have to add another objection which consists of a charge of irrelevancy.

There are instances of abnormal soul-life which must be regarded as well established, such as somnambulism, or a display of mental activity in sleep, hypnotism, double personality, etc. I might here also mention the frequent success of faith cure and Christian science. All extraordinary conditions are instructive, but they do not teach

us anything new concerning the soul. They are merely exaggerated cases of the normal activity of the soul.

Though the several religious beliefs of immortality which in their general intentions are sympathetic to me, are not tenable before the tribunal of science, I am fully convinced that the nucleus of truth which they contain makes them valuable and renders them of service within certain limitations. They originated naturally under definite needs, and in their several solutions we find embodied deep truths concerning man's after-life. Man is not annihilated by death; his life is not as if it had been writ in water; his soul remains a living factor even in this present world. So the Mazdaian, the Buddhist, the Brahman, the Christian, and other views of immortality are products of an instinctive groping for the truth, and also state the truth in terms most congenial to their several devotees according to their various conditions of life. These several solutions are not true in all their details, but they are as if they were true. They may be regarded as allegories true in spirit but not in the letter; they are statements positively untrue in the letter, yet animated with certain tendencies which are true in the significance which they endeavor to express. They are like fairy tales with a wholesome moral; the tale is fiction, the moral is true. They are helpful in enforcing right rules of conduct and so though untrue if taken literally, they are true in their purpose; they can be used as a working hypothesis, because they are *as if true*.

It is this *as if true* which constitutes one of the main difficulties of the immortality problem. This *as if true* has induced many serious thinkers to retain the untrue formulation or some traditional solution in spite of its palpable untenableness; and this *as if true* is the weightiest evidence against the bare and bald negation of immortality in whatever form it may appear. It will be worth while

to ponder on this undeniable fact that the several solutions of the immortality problem are *as if true*. They may be contradictory one of another, yea, each one of them may in its literal meaning be self-contradictory; yet if we make allowances for religious allegory which uses the language of poetry and gives instruction by the method of fairy tales, we shall appreciate their paramount significance in the life of mankind and will understand the continued use of them even among unbelievers. There is no objection to them provided we bear in mind that they are poetry and not science; and the truth which they contain shall not be less dear to us if we know that the multitudes need parables, while only the few can grasp their full meaning.

THE SPIRITUAL BODY.

St. Paul, the apostle, says in 1 Cor. xv. 42-49:

"So also is the resurrection of the dead. It is sown in corruption; it is raised in incorruption:

"It is sown in dishonor; it is raised in glory: it is sown in weakness; it is raised in power:

"It is sown a natural body; it is raised a spiritual body. There is a natural body, and there is a spiritual body.

"And so it is written, The first man Adam was made a living soul; the last man Adam was made a quickening spirit.

"Howbeit that was not first which is spiritual, but that which is natural; and afterward that which is spiritual.

"The first man is of the earth, earthy; the second man is the Lord from heaven.

"As is the earthy, such are they also that are earthy: and as is the heavenly, such are they also that are heavenly.

"And as we have borne the image of the earthy, we shall also bear the image of the heavenly."

In explanation of this passage we must inform the reader that the word "natural" is more an interpretation

than a translation, and ought to be replaced in a literal version by "psychical"; while the word "spiritual" is the Greek "pneumatical."²

The apostle distinguishes three bodies,—the body of flesh, the psychical body, and the pneumatical or spiritual body, and in doing so he adopts a system prevalent among the gnostics whose philosophy resulted from a syncretism of all those religious ideas that were in vogue among neo-Platonists and kindred schools shortly before the beginning of the Christian era.

Plato distinguishes between the soul and the spirit,—the soul or *psyche*,³ and the spirit or *pneuma*.⁴ The *psyche* is the realm of sentiment, desire, passion, yearning, etc., while the spirit is the domain of comprehension, of understanding, of intellectual vision. Feelings are apt to interfere with a rational view of things so as to blur the eye of the mind, and thus Plato regarded the *psyche*, the animal soul, as one of the lower faculties of man. The master of the ship of life should not be the soul but the spirit, the *pneuma*, which alone is the divine part of man. It is a Platonic idea when Christ declares that God is *pneuma*.

We note in this connection that the authorized version translates this passage "God is a spirit" while the original reads "God is spirit."⁵

If spirit is connected with activity so as to be a conscious personality it is called in Greek *nous*,⁶ i. e., "under-

² The proper English form of the Greek term *πνευματικόν* is "pneumatic," but it is a pity that this word has been usurped since the invention of the bicycle to designate the air-filled rubber tire, and to obviate the ludicrous association which would naturally be attached to the use of the word in a religious connotation, we prefer in this connection to introduce the word "pneumatical." Although the Latinized ending on the Greek root is not commendable, still it is excused by the existence of the analogous form "psychical."

³ *ψυχή*.

⁴ *πνεῦμα*.

⁵ *πνεῦμα ὁ θεός*. Literally "Spirit is the God" but "the God" in Plato's language means "God" as "the only God" in a monotheistic sense, and "spirit" is predicate as indicated by the lack of the article. Therefore an inversion of the order of words is justified to indicate the grammatical construction.

⁶ *νοῦς*.

standing or mind," and Anaxagoras of Klazomanæ was (according to Aristotle) the first philosopher who attributed the quality of premeditating thought to God, declaring that God is mind or understanding (*nous*). This monotheistic God-conception was so great an improvement upon the established religious views of his age that Anaxagoras, though a personal friend of Pericles and other influential men, was duly persecuted for impiety and atheism, and had to flee for his life from Athens to Lampsakos.

St. Paul's theory of the three bodies is not a Hebrew doctrine, but typically Greek, or rather Hellenistic, a term which applies to the latest phase of Greek literature when Alexandria had become a center of learning and many Oriental thoughts had become assimilated to the Greek world-conception; producing the gnostic movement, the precursor of Christianity.

The gnostics believed that in the course of man's development the body of flesh is first. It is the husk in which the grain of the soul develops; but in its turn the soul (that is to say the seat of feeling and longing, or as we might say "the animal soul") is not the end of man's destiny. The man of strong sentiment is lower than the man of clear thought, and so the organism of sensations and sentiments is to be regarded as another husk under which the grain of the spirit grows.

The apostle proves the resurrection of the dead in the same epistle (xv. 36-37) as follows:

"Thou fool, that which thou sowest is not quickened, except it die:

"And that which thou sowest, thou sowest not that body that shall be, but bare grain, it may chance of wheat or of some other grain."

He selects an example of nature. The grain of wheat is sown and a new blade is raised with ears full of grain, and this simile, as Dr. Radau proves in his article on "Bel.

the Christ of Ancient Times," (*The Monist*, XIV, especially pages 96-112) is an echo of the ancient Babylonian religion, where Marduk the god of vegetation descends to the place of the dead and rises from the grave to a new life in the spring festival, the Babylonian Easter. His wife Tsarpanitum is popularly called Zer-Banitu, which means "the one who creates or produces seed" (*ibid.* pp. 109-110).

Paul was a Jew by birth but he was born and raised in Tarsus, a city in the southeast corner of Asia minor, which was well known for its learning and great religious interest. Its schools were famous and we know of two tutors of emperors who had studied there,—Athenodorus, the tutor of Augustus; and Nestor, the tutor of Tiberius. Apollonius of Tyana, the prominent representative of gnostic thought, so much like Paul in many of his views, had studied the art of healing at Tarsus. Rome had given to Tarsus municipal freedom, the highest honor which in those days could be bestowed upon any community within the dominion of the Roman empire, and we know that Paul frequently made use of his privilege of being a Roman citizen. Though it is not probable that he attended University lectures at Tarsus, it is incredible that the many gnostic ideas that pervade the apostle's doctrines should not have come to him in his early childhood, for they are to him natural and self-evident truths which need no demonstration; while his particular Jewish tenets, especially the recognition of Jesus as the Messiah, is the new gospel which he preaches to the world and endeavors to prove by argument.

Paul's view of the three bodies must have been known to the Corinthian congregation whom the apostle addresses. He does not stop to explain the terms and thus it is evident that they form part of the philosophical atmosphere of the age. The apostle declares that as the seed is enveloped

in several husks so the immortal spirit of man grows underneath the husks of the body and of the soul. The spirit alone is immortal. The soul or *psyche* is transient and subject to corruption and dishonor as much as the body of flesh.

When Christianity found its main support in Rome, the leaders of Christian thought no longer understood the difference between *psyche*, or "animal soul," and *pneuma*, or "spirit," and thus they neglected to discriminate between the two, the soul or *anima*, and the spirit or *animus*. Both were practically identical to the Romans.

The Vulgate translates the word "psychical" by *animale*, which is quite appropriate in so far as according to Plato's views animals have a soul, while men in addition to a soul have also a spirit.

Let us bear in mind the original meaning of St. Paul's passage and let us augment it by another passage in the same epistle, chapter ii. 14-15, where we read:

"But the natural man receiveth not the things of the Spirit of God: for they are foolishness unto him: neither can he know them, because they are spiritually discerned.

"But he that is spiritual judgeth all things, yet he himself is judged of no man."

The spiritual body is not born but must be acquired during our life. The psychical body is the life principle which makes it possible for us in common with all animals to live and to feel. God is possessed neither of a body of flesh, nor of a soul. God is (as we read in the Fourth Gospel) pure spirit or *pneuma*. Man becomes immortal by partaking of the spirit or the *pneuma* of God. The more man partakes of the spirit, the more he develops spirituality,—what Paul calls the "spiritual body." The aim and purpose of mankind is the development of the "spiritual" man. By being spiritual, man becomes God-

¹ ψυχικόν.

like, and the purely spiritual man is the God-man, or Christ. Man in his natural state is on the same level as the animals. He is mortal and is possessed of a *psyche*, a soul, or a psychical body only. The psychical man is called the first man or Adam, the spiritual man is called the second Adam, and here St. Paul adopts a term of the Jewish Cabala. The teachings of St. Paul always deal with the significance of the spiritual or pneumatical in contrast to the psychical, i. e., the material or sentient, or the animal soul.

All the blessings which proceed from God are spiritual or pneumatical, so Paul says in Rom. vii. 14, "The law is spiritual, but I am carnal,"

ὁ νόμος πνευματικός ἐστίν, ἐγὼ δὲ σάρκινός εἰμι.

and again in Rom. i. 11, he expresses his anxiety to see the Romans to give them a "spiritual gift."⁸ He further admonishes the Romans to take up a collection for the impoverished congregation at Jerusalem, on the plea that the Gentiles owe the Jews a debt, because they (the Gentiles) have been made partakers of the spiritual things⁹ of the Jews. St. Paul explains the manna in the desert and the water of the rock struck by Moses to be spiritual food wherewith the Israelites had been kept alive by God.¹⁰

The religious devotion of the gnostic movement found expression in congregational hymns, addressed to the deity. Philo mentions this fact of the Therapeutæ of Egypt, and we know that the same custom obtained among the early Christians. Paul speaks of them in Eph. v. 19, and Col. iii. 16 as psalms and hymns and spiritual songs.¹¹

The Apostle declares in 1 Cor. xii-xiii that God manifests himself in a variety of spiritual gifts such as wisdom,

⁸ χάρισμα πνευματικόν.

⁹ τὰ πνευματικά.

¹⁰ 1 Cor. x. 3, cf. Ex. xvi. 15ff.; 1 Cor. x. 4, cf. Ex. xvii. 6.

¹¹ ψαλμοὶ καὶ ὕμνοι καὶ ᾠδαὶ πνευματικαί.

knowledge, prophecy, faith, the gift of healing, the working of miracles, diversities of tongues, the interpretation of tongues, etc., and charity the greatest of all (ch. xiii), and he admonishes the Corinthians that all are equally members of the same body which is Christ.

If we now try to translate into scientific terms the language of St. Paul, we will understand that these notions are not mere fancies but that they are based upon practical experiences and are definable from the standpoint of positive psychology and philosophy. Man's existence is not limited to the physiological functions of his body. His interior life consists of feelings concentrated in consciousness. Modern psychology, or more exactly psychophysics, explains the psychical condition of man as the concomitant of physiological functions. The soul of man (soul understood in the same sense in which Plato speaks, as animal soul) is not immortal. The immortal part of man is his spirit.

All the psychical features of man are one aspect only of his life. They do not exist by themselves and are so many abstractions. Such are the sensations of touch, sight, hearing, etc., emotions, volitions, and kindred feelings. They are psychical and not corporeal; they are states of consciousness, not bodily objects, and we must know that if their totality is spoken of as constituting a body, we have to take the statement *cum grano salis*. It is a mere allegory which may be considered as true in so far only as all psychical dispositions of man constitute an organic whole, a hieratic system, which is quite analogous to the body of a living organism.

When trying to understand the language of St. Paul we must allow him to speak of the system of psychical functions as the "psychical body." In defense of this way of speaking we might say that the Brahmans and the Chinese also use the term "body" figuratively in the sense of "sys-

tem." The entirety of the laws that constitute the world order is spoken of in the Buddhist Mahayana school as the body of the law which is the eternal Buddha, in the sense of the Christian *logos*, that was in the beginning, viz., the world-order or the system of eternal laws.

The idea of a psychical body originates naturally and necessarily in a primitive age of civilization, and may not improperly be called the dream body. When man falls asleep his body of flesh lies quiet on the couch, but his soul remains active, he dreams. He roams about at distant places in a body that is not subject to the laws of matter. The dreamer meets persons that have died and they, too, appear in a similar bodily shape. Such was the Egyptian idea of the luminous body, the Homeric idea of the shade, and other kindred notions, many of which have come down to our present time, and we cannot doubt that they are kin to the gnostic idea of a psychical body.

We now ask, what is spirit? Spirit in the language of the gnostics is the highest efflorescence of the soul. The soul contains the germ of the spirit, but though the spirit grows within the soul, it comes from God. The result of man's psychic life is comprehension, and comprehension no longer partakes of sentiency, or passion, or desire. It rises into a new realm, the spiritual world, which in modern language we would call the domain of abstract thought.

Abstract thought is not feeling and must not be identified with sentiency. That it originated through sentiency by experience in the material world, is not disputed, but it is claimed to be radically different from the latter in partaking of the nature of God; and this is true in its way. Sentiency is always particular and exists somewhere at some moment in some sentient creature, while abstract thought formulates general laws which apply anywhere and everywhere. They are universal, omnipresent and eternal.

This important feature of spiritual life, viz., the attainment of that which is eternal, appeals to the gnostics with great power because here they see a chance for man to attain to the divine and to acquire immortality.

If we now ask whether the spiritual of man is actual or a mere illusion, we come to the conclusion that the spiritual indeed is that part of man which imparts to him immortality. It is that which constitutes the humanity of man, that feature which gives him lordship over nature, and we may add, that which makes him kin to God. The rich life of the spirit covers the domain of science, religion, ethics, and has since the origin of man been the factor that is leading him higher and higher in the ladder of evolution.

The realm of man's spirituality constitutes a system as much as does the psychical and the corporeal and so the gnostics speak of a pneumatical or spiritual body, a conception which if not taken too literally is sustained by facts in so far as the spiritual portion of every man is not a disorderly conglomeration of abstract ideas but constitutes a definite organic system extending with its references into the past as well as the future not less than to contemporary events.

Man's personality is not limited to his bodily system even if we include his psychical functions. Our idea of the personality of a man includes his rights, his possessions and his accomplishments reaching out to things inanimate, conditioning, determining and shaping the surrounding world according to his power and privileges. His signature indicates his will and disposes of his bank account as if he paid out the sums indicated thereby in his own bodily personality. The spirit of an author is present wherever his books go, and it affects the people who read them.

Thus we see that the spirit of man rules in a sphere that is superadded to his psychical life, and though the

psychical may pass away, the spiritual or pneumatical will endure.

In Roman law the idea was adopted that the will of a man can extend beyond his life, and bequests are based on the idea that they represent the will of the deceased. The testament or last will is respected as much as if the man who made the will were still alive. It may be set aside on the same grounds that the request of a living man under certain conditions becomes objectionable, not otherwise.

If we apply this view of a spiritual existence to all the factors of life, we can not deny that man during his life is building up for himself a spiritual body, and that when he dies this spiritual body will continue after him. According to his deeds it will assure him an immortality within the domain of human society as well as generally in the history of the world. A man lives on in an institution which he has founded as much as if he had remained in life, so long as his spirit continues to be the dominant factor in its administration. The spirit of Shakespeare, of Goethe, of any poet and also of any statesman who has helped to shape ever so remotely the conditions of our present life, is incorporated in the general spirit of mankind, and has thus acquired an immortality that is not subject to corruption.

This spiritual condition was spoken of by Christ as the treasures which neither moth nor rust doth corrupt, and where thieves do not break through or steal.

We must notice in this connection that consciousness, sense-activity and the entire realm of sentiment, being the psychical body, will have no part in the immortality of the spirit. Consciousness together with all feeling is clearly affiliated with bodily life. Accordingly it partakes of the corruption of the body of flesh; it is subject to transiency, being limited to the particular, to the present moment, to a definite function of the corporeal. It is disturbed by

disturbances of the corporeal body and passes away with its corporeal substratum. Consciousness, accordingly, should not, on the basis of the gnostic philosophy (adopted by St. Paul) be considered as a portion of the divinity of man. It is sentiency and so it is subject to all the faults of sense-life.

While there is no doubt that consciousness is a state of feeling, intensified by concentration, (and accordingly it should be regarded as a function of the psychical body, not of the spiritual body), we are aware of the fact that the apostle did not draw this conclusion. Nor must we expect of him a strict logical consistency, for he was a preacher and not a professor, a moral leader, not a logician, a prophet, not a philosopher. For his practical work as a preacher and teacher, he could make better use of the hazy idea of a spiritual immortality in which the psychical element of consciousness was tacitly retained.

Man is essentially a sense-being. He clings to the material, to the sensual, to the particular, and looks upon the spiritual, the general, the universal, the supersensual, as mere nonentities, and thus in the progress of Christianity the persistence of consciousness has always been made the most essential part of man's immortality. The higher ideals of life being mere abstractions are said to count for nothing unless man preserves exactly this same consciousness of the identity of his personality. The founder of an institution, it is sometimes claimed, is little benefited by the persistence of his intentions, by the good service he rendered to his fellow beings, by the actualization of his will, unless he knows of it and is conscious of the fact. The fact itself, it is claimed, counts for nothing if consciousness is eliminated.

Man's after life is spiritual, and, as Paul says, not psychical. The psychical is transient while the spiritual endures. Nevertheless the psychical element is not absent,

for the memories of future generations in whom the departed spirits continue to live are aglow with consciousness, and the spiritual body of past generations animates the psychical life of the present and utilizes it as its own. Therefore we may say that, although the psychical functions of each individual become extinct in death, man's life after death is such as if they continued; and it is quite natural that almost all religions represent man's immortality as a continued state of consciousness. Man's personality remains after death a living presence, and this living presence makes its influence felt *as if* he were conscious of it. He draws, as it were, on the consciousness of the living, he utilizes their vitality, their sense organs, their sentiments, and so the people who believe in a conscious immortality are after all not far from the truth.

* * *

We will now discuss the idea of a spiritual body as Professor Fechner held it.

Fechner's theory of the soul, and also of its immortality is based on the doctrine of psychophysical parallelism which explains all psychical phenomena as concomitant to physical functions. All ideas, sensations, and sentiments which we experience, are accompanied by a definite commotion in some definite part of the brain, and *vice versa*, some brain-motions are accompanied by feelings. What is objectively a function of cerebral structure manifests itself subjectively as a state of consciousness.

This view, with but insignificant modifications, is recognized by all psychologists of standing, but Fechner makes a peculiar application of it not only to the plant world, but also to inorganic processes, to the planets, the sun and the stars, in so far as he claims that the objective world is throughout animated by analogous feelings, and though in our present life our consciousness is limited to

our physiological system, he states that after death it will be transferred to our spiritual personality which we have created during life. His view of immortality is unique in so far as it is a rare combination of truly scientific ideas with fantastic notions. We deem his work worthy of a careful perusal because he succeeds in pointing out the significance of the spiritual body and picturing its reality with the accuracy of a naturalist. This latter feature of Fechner's psychology tallies with our own convictions, and it is therefore well worth mentioning that both Fechner's and our own views, have been worked out in perfect independence—a fact that goes not a little way in proof of their truth. We have been familiar with Fechner's general doctrines but we have only lately devoted our special attention to his "little book on life after death."

Fechner in his book *On Life After Death*,¹² explains the significance of spiritual life and points out that man is actually preparing during his life a new and higher type of existence which will bear the stamp of his personality. It is generally conceded that the dead continue to exist in the memories of the living, but Fechner goes further, he insists on the reality of these memories which constitute the vehicle of man's personality in his life after death, and his arguments are convincing; yet he fails in one essential point.

Fechner claims that at the moment of death man's consciousness is transferred to his spiritual body, and that thus the soul exchanges its present habitat for a more ethereal existence. While we agree with him that the spiritual body of the deceased person is immortal, and that through it, in it and with it, he continues to live, we find no reason to assume that the soul or psychical body passes out in an actual and local transmigration into another place where

¹² Translated from the German by Hugo Wernecke. Chicago: The Open Court Publishing Co., 1906.

the spiritual body may happen to be. Death is simply a dissolution of our corporeal existence, and in the body of flesh, consciousness ceases. There is no migration of either a soul or a spirit for the simple reason that neither of them can travel from one place to another. The animal soul (that is to say the *psyche* in the narrow sense of the gnostics), depends on the psychological functions of the brain, and with the destruction of the brain it ceases, but for that reason death is not merely the extinction of life. It is not the purely negative act of ceasing to exist. It has its positive aspect which may be called a finale and a climax. Death is like the conclusion of a book, or the last line of a poem, and summing up all that has been said, it is the consummation of life. The death of different persons may be of different importance. The death of Giordano Bruno was a death of heroism which raises him to the rank of a martyr of truth; and the same is true in a higher degree of Christ, whose death on the cross made him worthy to be regarded as the Saviour, the Christ, the Messiah.

The spiritual body may or may not be modified by the death of a man. The death of a man may have an effect upon his spiritual personality, but after all the spiritual body is to be built up mainly during our life by our thoughts, our words, and our deeds. Our immortality accordingly is not our birthright, but it is of our own making and must be worked out by us during our life in the flesh.

The consummation of our lives by death renders our spiritual existence more stable and unchangeable, and will also give it in many cases a greater solemnity, but otherwise it can change nothing in its constitution. The ceasing of consciousness here can not produce the appearance of consciousness there, yet we would not deny that the reality of our spiritual existence after death is assuredly

not less than it was at the time of life, and we will probably not be contradicted by any one when we claim that the spiritual existence of man is not less superior to the psychical than the psychical is to the corporeal. What would a man be if his spiritual personality were cut off, and he would be reduced to his animal soul only, remaining in possession of his feelings and bodily powers while he is shorn of his intellectual accomplishments, together with all his social, financial, and other human prerogatives! He would merely vegetate and would have to be taken care of in an asylum in the condition of an animal that is endowed with a human body. In his spiritual personality man grows beyond his bodily self and in a domain of purely relational elements in the realm of pure form, he builds himself up a spiritual existence, that will serve him as a mansion for eternity. Our body of flesh will die and decay, but this intangible system of conditions created by our thoughts, words and actions during our pilgrimage on earth will endure. He is wise who makes it his headquarters while still in life, for it will be our home when the tabernacle of our body of flesh has given out.

Here Fechner has not yet overcome the sensualism of the traditional soul-conception, and we can think of no scientifically tenable argument that would favor his proposition. But when we grant Fechner that man's spiritual existence in life after death is a real factor, concrete, personal, and actual, we will also add that it manifests itself *as if* this life were carved by a personality endowed with consciousness, and no one can blame us if we introduce this as a feature of it by figure of speech. If we are permitted to interpret Fechner in this sense, we shall find his theory recommendable.

We will not dwell long on the points where we can not agree with Fechner. They are all corollaries of the proposition that "in the moment of death, man will all at once

became conscious of all the ideas and effects of his actions in life" (p. 36). According to Fechner our bodily frame "holds us in bonds" which must be undone in death to give us the higher consciousness of our union with other spirits (pp. 66-67, 75), and when in death "eternal night sinks down on man's bodily eyes, a new day will break upon his spirit" (p. 76). Fechner claims that we shall no longer need our eyes because we acquire a new and higher kind of vision (pp. 82f.; p. 120), such as only the sun and all the planets possess, when emitting and intercepting rays of light.

Fechner seems to accept telepathy as a fact—not telepathy as we explain it, or as Goethe understands it in his poem *Wirkung in die Ferne*, but as an influence "without the mediation of mouth, ear, or hand" (p. 79, cf. p. 59).

To Fechner it is no mere figure of speech when he says "You will be able at will to make a dead person happy or miserable" (p. 62). We do not deny the deep truth of this conception, but we would not accept it in the literal sense that Fechner does. A dead mother will be a living presence with her child, her memory will prove a blessing, if it be kept sacred, it will prove a support in temptation and a comfort in affliction, and if he follows her guidance and remains worthy of her, her picture will be cheerful, she will become a source of joy and happiness. I say here purposely "she," for the mother's memory picture in the heart of her child is one of the mansions which she builds up during life-time, and in it she has taken up her abode. I agree fully and wholly with Fechner as to the reality of this spiritual existence of ours that will be illumined with consciousness as furnished by the physiological constitution of the son, but at the same time I draw the line when Fechner ensouls the entire system of this higher life of the departed with feelings which to our knowledge are only concomitants of physiological processes.

The same is true of ghosts. Fechner says:

"You have also heard of ghosts appearing—what the doctors call phantasms or hallucinations. They are indeed hallucinations of the living, but, at the same time, real manifestations of the dead. The faint images in our memory are such manifestations, those vivid apparitions are only the more so. It is no use worrying whether they be one thing or the other, for they are really both things at a time. And as you are not frightened by the images within you, being present manifestations of spirits, you need no more be frightened before the apparitions before you."

Certainly the hallucinations of Macbeth are real to him and the murdered king is truly present in his mind, but for all that there are no ghosts, no hovering spooks and phantoms who manifest themselves.

According to Fechner the dead possess not only their spiritual body which they have built up during their lifetime, but in addition also a peculiar kind of consciousness which is a continuation of the consciousness of their earthly life whence it is transferred into the spiritual body in the moment of death.

We can not follow Fechner in this most significant point of his doctrine of immortality. Here he deviates from the strict principles of science and allows himself to be carried along with his wishes, his hopes, and his faith. Yet we will gladly make the same concession to him that we make to religious doctrines. His view though untenable in its literal meaning, is *as if true*; it incorporates a truth that is significant and that should not be denied.

We conclude with a condensed and generalized statement of our proposition which may be summed up thus: the doctrines of immortality, formulated by the several religious faiths, are forcible and poetic descriptions of the

fulfilment of legitimate wants of the human heart; these several descriptions are not exact scientific statements and are, one by one, untenable in their literal significance, if tested by a severe and rigorous critique. Yet it would be wrong to discard them off-hand as errors or superstitions, for after all, they are as if they were true. The wants of the human heart which are therein expressed find a glorious fulfilment in every way that, judiciously considered, man may expect. If man had the wisdom of omniscience, he would be satisfied with the world-order as it is, and also with the fate that awaits him after death.

EDITOR.

THE EXPERIMENTAL DATA OF THE MUTATION THEORY.

B. EXPERIMENTS WITH OENOTHERA.*

CONVINCED that the origin of specific characters should be amenable to experimental investigations, Professor De Vries began in 1886 a search for suitable material for his researches. He brought more than one hundred species of the native and introduced flora to his garden; his purpose in doing this was not their improvement by selection but simply to secure convenience and accuracy of observation which would have been quite impossible with the plants still in the open. One of the species, however, showed itself quite different from the others, and the history of this form we shall now relate in its main points, as briefly as possible.

In a deserted potato field near Hilversum an American primrose, *Oenothera Lamarckiana*, often cultivated in the European gardens and running wild extensively, had been growing for about ten years as an escape from a neighboring source and had taken possession of about half of the field where it was represented by hundreds of individuals when the spot was noticed in 1885. The plants showed the usual fluctuating variability in a pronounced degree as well as occasional malformations, such as fasciations and the transformation of leaves into conical pitchers, but

*A review of the comparative data of the mutation theory and of the insufficiency of selection appeared in this journal for October, 1904.

it was not until the next summer that the most important discovery was made.

Then two groups of plants, each of only a few individuals, but of a well characterized and distinct form, were discovered, and it seemed at once evident that these belonged to a new elementary species and that it was not improbable from their limited areas of distribution that they had each sprung from the seed of a single individual. No comparable forms were found in the great herbaria at Leiden, Paris or Kew. More significant still, the forms showed themselves constant in culture from the first. One of the new species was designated as *Oenothera brevistylis* because of the much shorter style, while the other, with smooth leaves and much handsomer foliage than *O. Lamarckiana* and conspicuous for the habit of producing petals which lack the notch at the margin, was called *O. laevifolia*.

The characteristics separating these species from the parent, *O. Lamarckiana*, are many and not merely those given above, but here, as with all other species mentioned in this paper, space cannot be given to detailed descriptions which would hardly be of interest to the general reader. Nor can we attempt to describe in any detail the series of laborious cultural experiments which followed the discovery of the two new elementary species in the deserted potato field at Hilversum. The merest outline must suffice, for it is the object of the present paper with its limited space to present the philosophy of the mutation theory as compared with the theory of fluctuating variations with just enough illustrative examples, rather than to give a detailed review or criticism of the data upon which the theory rests.

In the fall of 1886 two lots of material of *O. Lamarckiana* were selected for the experimental garden at Amsterdam. The first consisted of nine rosettes, and the second

a quantity of seed. Besides these, seed was collected from the newly discovered *O. laevifolia* and plants of *O. brevistylis* were taken bodily. Occasionally seed was taken from the original locality for check tests.

In accordance with the terminology of sugar beet selection the first three groups were designated as families and as such have been cultivated to the present time.

The descendants of the rosettes formed the *Lamarckiana* family, those from the seed of the *O. laevifolia* the *Laevifolia* family, and from the seed of the five-celled *O. Lamarckiana* fruit came a group designated as the *Lata* family. We may confine our attention here to the *Lamarckiana* family.

The rosettes taken from the field at Hilversum flowered in an isolated bed and produced an abundance of seed, from which, as the second generation, about fifteen thousand individuals were produced, among which were found two forms not seen before. These were distinguished as *O. nanella* and *O. lata* and were represented by five individuals each.

Six typical specimens of *Lamarckiana* served as seed plants, and in the third generation of about ten thousand individuals three each of the two new forms mentioned appeared, and in addition *O. rubrinervis*, of which one example was observed.

For the sake of improving methods of cultivation and artificial pollination it was necessary to discontinue the further cultivation of the *Lamarckiana* family for a time, but when it was again resumed four years later, the fourth generation of about fourteen thousand plants was found to contain three hundred and thirty-four of the mutated individuals, of which one-half belonged to four forms which had not yet shown themselves in the cultures, *O. gigas*, *O. albida*, *O. oblonga* and *O. scintillans*. The culture was conducted for four generations more with a greater

or lesser number of individuals, and always with a number of the newly originated forms though no more new types appeared in these later generations. In all of these, however, the total number of individuals was less than that of the fourth generation alone. The eight generations numbered about fifty thousand individuals of which about eight hundred were mutants belonging to seven new elementary species. Of these, but one appeared only a single time.

During the first years of the experiment the plants were so isolated that there was no danger of crossing with any other form, but later the flowers were covered with transparent paper bags and self-fertilized so there could be no possibility of hybridity. It is thus certain that the ancestors of each of these eight hundred new forms produced between 1888 and 1899 had had typical *O. Lamarckiana* ancestors as far back as 1886 and in all probability much further.

For the botanical specialist it would be highly desirable to present detailed descriptions of these new species, but it would be of little interest to the general reader, and it must suffice to say that, though the differences are small, they are many and so well defined that there is no danger of mistaking the new forms. Indeed some of them may be at once recognized in the seedling stages, though others require a greater degree of maturity to exhibit their characteristics. It is altogether probable that one and one-half per cent. does not represent the total number of distinctly new forms, since it was necessary to weed out the most of the individuals as soon as they showed distinctive characters, and it is quite probable that some of these examples cast aside as typical *O. Lamarckiana* would have later, perhaps when flowering, shown themselves to be separable from the parent by well defined differences. A brief account of the origin of these new forms and their conduct

under cultivation will be much more profitable than technical descriptions.

O. gigas was the only one of the seven forms which was observed but a single time in the *Lamarckiana* family. In the other families it appeared but twice. This single individual which had had for at least three generations typical *O. Lamarckiana* as ancestors, formed the beginning of the new species *O. gigas*. From the seed of this self-fertilized individual there were grown over four hundred and fifty plants. These were conspicuous for their constancy to the new specific type which differed clearly and sharply from *O. Lamarckiana*. Only a single aberrant individual was found. This showed the characteristics of *O. gigas* but was a dwarf and so was given the varietal name of *O. gigas nanella*. Not one reverted to the characteristics of the *O. Lamarckiana*. Thus a new elementary species may originate in a single individual and be perfectly constant from the first.

O. albida, occurring every year in greater or lesser numbers in the most of the cultures, is a very characteristic form, at first considered pathological individuals and not counted. Even when it was recognized that this represented a distinct type it was long before the weak plants could be brought to flower and mature fruit. When this was finally accomplished only a few seeds were produced and so the experiment was not an extensive one, but so far as it was carried the form was perfectly constant in the second and third generations.

O. rubrinervis is distinguished from the others by its form and the characteristic red coloration of the veins of the leaves and the stripes on the calyx. It also exhibits a high degree of brittleness due to the limited development, though not entire absence, of the strengthening bast portion of the stem. A slight blow or lack of care in the plucking of a fruit is sufficient to break the stem into a

number of pieces. This characteristic never failed; every plant classed in its rosette stage as *rubrinervis* could be counted on to produce later a very brittle stem and red calyx and fruit. In the year 1896 about one thousand examples of this species were grown from seed produced by eight individuals which had originated immediately from the *O. Lamarckiana* stock the year before. All were typical *rubrinervis* except for two plants. One of these had the characteristics of a new species, here appearing for the first time, and was designated as *O. leptocarpa*, while the other was clearly *O. Lamarckiana*, probably from a seed already in the ground. This plant was naturally the cause of some concern, but all doubt was removed when two check experiments, aggregating nearly three thousand plants, showed the species perfectly constant, and justified the conclusion that *O. rubrinervis* is a good elementary species.

O. oblonga appeared in every generation after the third and in considerable numbers, being recognizable when the seedlings had produced about the sixth leaf. The seed from seven biennial plants produced 1683 seedlings all of which, excepting one with the characteristics of *O. albida*, were typical *O. oblonga*. The seed of the annual plants germinated poorly, only 64 plants being produced. With the exception of one *O. rubrinervis*, all were true. In neither lot were the *O. Lamarckiana* characteristics to be recognized. *O. oblonga* may then be regarded as constant from its first appearance but with the power of producing other new forms.

In the preceding forms and in those which are to follow there is nothing comparable with the results of general horticultural experience with other plants. In *O. nanella*, the dwarf primrose appearing in every generation, we have a form which is very similar to the dwarf varieties which occur in so many cultivated plants.

But some one will at once suggest that such forms are only varieties and not species. In truth these dwarfs may as well be called *O. Lamarckiana nanella* as *O. nanella*. So long as ambiguity does not result, it is quite unessential whether an organism with a given set of characteristics be spoken of as species or variety. The point of real interest is to know whether these characteristics are heritable and constant or whether they are merely the expression of a widely fluctuating variability to be lost in succeeding generations. Since *O. nanella* differs from the parent form in only the one characteristic—that of size—perhaps it may be as well to speak of it as a variety, but if in cultivation it shows itself true to seed it must be remembered that is as worthy of the name of an elementary species as are other constant forms.

O. nanella is probably the most easily recognized of the new forms, unless it be *O. lata*, throughout its entire development, beginning as early as the second leaf. The first counting for this species, or variety, was made with 440 plantlets, from seed of self-fertilized parents. All of these showed themselves true. As a second experiment twenty individuals, originating immediately and without transition from *O. Lamarckiana*, were self-fertilized and produced 2463 seedlings, all of which were the typical dwarf form. A still more extensive experiment was that in which 36 plants were self-fertilized and produced over 18,000 typical *O. nanella* seedlings, among which the only deviations were three plants showing the additional characteristics of *O. oblonga*, which may therefore be designated as an elementary type of second rank, *O. nanella oblonga*. When *O. nanella* occurred in other families it was very constant. Forms in which the characters of more than one species were noted, as *O. lata nanella*, *O. nanella elliptica*, etc., were very rare.

As soon as the second or third leaf unfolds, the species

known as *O. lata* is recognizable. It appears almost regularly, but in exceedingly variable numbers representing from 0.1 to 1.8 per cent. of the entire culture. In addition to its other characteristics, this form is always purely pistillate, no fertilization with its own scanty pollen ever having succeeded. Crosses with the pollen of *O. Lamarckiana* were almost perfectly fertile and produced in the second generation from 15 to 20 per cent. of *O. lata* plants.

The six new elementary species just described have been characterized by a remarkable degree of constancy, showing in the many thousands of individuals only one plant of *O. Lamarckiana*, and this was without doubt due to a seed in the soil. Only rarely have the new species shown the power of giving rise to other new forms. But in the seventh of the series originating from the main stem of the *Lamarckiana* family during its eight generations, *O. scintillans* shows quite different characteristics. With the exception of *O. gigas* and some others not yet described, *O. scintillans* is the rarest of the new species. With self-fertilization it produces not pure *O. scintillans*, but *O. scintillans*, *O. oblonga*, and *O. Lamarckiana*, and in a more or less definite numerical proportion. Two groups seem to occur, one with 30 to 40 per cent. and the other with about 70 or more per cent. of the offspring true to the parent type.

We have discussed as briefly as possible the plants belonging to the *Lamarckiana* family. Earlier in this paper we referred to other lots of plants which were brought from the field at Hilversum. Each of these families was followed through, generation by generation, by the experimenter, and his results are described in detail under the headings: A Side Branch of the *Lamarckiana* Family, The *Laevifolia* Family, Two *Lata* Families, Mutation in Other Families, and Mutation in Nature. The results of these

investigations confirm those obtained in the *Lamarckiana* family so that we need not describe them here.

These "families," as De Vries has termed them, represent the principal experiments carried on for the purpose of observing the origin of new forms. Besides these extensive investigations, however, many sowings and countings were made for other purposes. These all furnish confirmatory evidence in support of the conclusions drawn from the more extensive and longer continued experiments. It may almost be said that mutations occurred in every extensive culture.

In general the new species are less mutable than the original *O. Lamarckiana* from which they spring, but there also occur among the new species very strongly mutable forms such as *O. scintillans*.

In crossing, the tendency to mutation is retained, and when *O. Lamarckiana* is produced from crossing it seems to exhibit the tendency in all its strength. Sowings of *O. leptocarpa*, *O. nanella* and *O. oblonga* proved true to type except for seven individuals in 3410 seedlings counted. The mutants in these cases represent about 0.2 per cent. of the individuals while from the seed of *O. Lamarckiana* from one to three per cent. or more are produced.

O. scintillans is a very mutable new species. Only about one-third of the offspring are true to the parent type while the other two-thirds are *O. oblonga* and *O. Lamarckiana* with a few mutants belonging mostly to *O. lata* and *O. nanella*. During six years of cultivation 38 specimens of *O. lata* and 29 of *O. nanella* were found among 7872 seedlings of typical self-fertilized *O. scintillans*. The 67 mutant individuals belonging to the two species represent about 1 per cent. of the total number, a percentage which approaches very closely that yielded by *O. Lamarckiana* itself.

Hybridization seems to increase mutability. The two

parent forms are found in the progeny of these crosses and in case *O. Lamarckiana* is not one of the parents it generally occurs as well. Crosses between *O. Lamarckiana* and *O. nanella* gave during the five years in which the experiment was tried 64 mutant individuals, *O. albida*, *lata*, *oblonga*, *rubrinervis* and *elliptica*, among the 8283 seedlings examined, or about 1 per cent. Among 1586 individuals produced by crossing *O. lata* and *O. nanella* during six years of experimentation, 31 mutated individuals, 15 *O. albida*, 14 *O. oblonga*, and 2 *O. rubrinervis*, were found, or about 2 per cent.

Crossings with the old and accepted species of the systematist, *O. biennis* and *O. suaveolens*, were also tried. *O. Lamarckiana* and the new *O. lata* were crossed with both of these older species and 1352 of the offspring examined. Mutated individuals belonging to the species *oblonga*, *lata*, *nanella*, *elliptica*, *scintillans* and *albida* occurred to the number of 29, or somewhat more than 2 per cent.

In all of these cases, then, the potency for mutation is about the same as in *O. Lamarckiana* itself.

As we have already mentioned, *O. Lamarckiana* itself often appears among the seedlings from crossed individuals. De Vries has made a comparison of the progeny of this species when produced as the result of crossing, with that of the other new species when produced in the same way, and has arrived at the conclusion that if seed be gathered from plants belonging to one of the new forms, results which correspond with those given above for the production of mutants from new forms are secured, that is to say about 0.2 per cent., while if that from self-fertilized *O. Lamarckiana* be sown the same tendency to mutation will be seen in the richness of the beds in mutated individuals.

In 1889 seedlings were raised from *O. Lamarckiana*

plants grown from crosses between *O. Lamarckiana* and *O. nanella*, *O. lata* and *O. Lamarckiana*, *O. lata* and *O. nanella*, and *O. lata* and *O. brevistylis*. In all, 43 mutated individuals, belonging to *O. albida*, *lata*, *nanella* and *oblonga*, were found among the 4599 seedlings examined.

About 1 per cent. of mutated individuals in these experiments compares very favorably with the other trials of the mutability of *O. Lamarckiana*, and a general survey of the experiments carried on by Professor De Vries leads us to the conclusion that whatever its source and whatever the number of generations through which it has been cultivated *O. Lamarckiana* retains a very constant potency for mutation. The new species, on the other hand, show their constancy not only by the absence of transition between themselves and reversion to the parent type but by their greatly reduced mutability as well. The capacity for mutation, however, seems to have been transmitted, though in a greatly reduced degree, from the parent to the daughter species, where it is to be seen in the production of an occasional mutant.

The theory of the origin of species by selection has been so long accepted that the term "experimental evolution" conveys at once to the mind a series of experiments in selection or in the modification of organic forms by controlled external forces. To preclude any such misunderstanding of the garden experiments carried on in Amsterdam we must repeat that in the main families described above there was no attempt at selection or the experimental production of mutations, a problem of highest importance for future investigation. The only purpose of the methods employed was to provide a convenient and accurate method of investigating the process which is taking place in nature.

These are two ways of observing mutation as it occurs in nature. The plants may be sought and studied in the

field, or large quantities of seed may be gathered and germinated under conditions favorable for growth and study. The first method is one of exceeding difficulty, and De Vries is the only investigator who has surely succeeded with it even in the most limited degree. The percentage of new forms is so small even when all the seeds are germinated and the number of seeds which reach or at most survive even the seedling stage is so few that this method must be discarded as quite beyond the limits of practicability. With large sowings of seed collected from the plants as they grow in the woods and fields, however, the case is quite different, and we may look with much hope of success to this method. The mutation is already determined in the seed, and germination in the greenhouse or garden affords only the possibility of accurate observation and counting.

Numerous sowings of this kind made by De Vries convinced him that species are for the most part in an immutable condition. It is quite probable, however, that further experiments in different regions will reveal other species which are in the same condition of instability as *O. Lamarckiana*.

Some of the new species of primroses were observed in the original habitat near Hilversum, usually as seedlings or young rosettes, rarely flowering, though two species seemed able to hold their own in competition with the parent form. The second method of search for the mutated individuals was also extensively employed. The following list gives the species observed in the field and those raised from seed collected there.

PLANTS OBSERVED.

- O. lata*. 1889, 1894.
- O. nanella*. 1894.
- O. spathulata*. 1886, 1894.
- O. elliptica*. 1886.

GROWN FROM SEED.

- O. lata*. 1887, 1889.
- O. nanella*. 1889.
- O. lata-nanella*. 1889.
- O. rubrinervis*. 1889.

Five of the new species originating in the garden were,

then, also found in nature. They occurred rarely, but usually several times in different years, and in such a manner that the later could not have been derived directly from the earlier individuals. These species are those which appeared most frequently in the experimental garden.

The first observation of a new form must not be regarded as its first appearance. Two of the new species, *O. elliptica* and *O. spathulata*, were found in the deserted potato field upon the first visit in 1886. It seems that the process of mutation was in full progress when the field was first visited. Whether mutation began when *O. Lamarckiana* began spreading over the deserted field or whether this characteristic was a much older one cannot be decided.

Systematic Characteristics of the New Species.

Discussions of questions of nomenclature are uninteresting enough for the scientist and will not be forced upon the general reader; but the source and nature of the material serving for any experiment or series of experiments is a matter of interest as well as of first importance, and before leaving the discussion of the origin of new species from *O. Lamarckiana* we must glance at the history of this species as far as it is known.

While it has shown itself quite constant under cultivation in Europe and America, it is not identical with any known member of the American flora, although it undoubtedly has its closest affinities with an American group. In the earlier European botanical writings, even so far back as 1635, there are references to a large-flowered *Oenothera* cultivated in European gardens, and this may have been the *O. Lamarckiana* as we now know it. De Vries and others have compared material of the species as we know it with the type material examined by Lamarck in the herbarium of the *Musée d'histoire naturelle*. Lamarck

saw neither living material nor specimens collected in the American habitat; his descriptions were prepared from dried specimens of plants cultivated in the garden of the museum. Two suggestions as to its possible origin seem most plausible; *O. Lamarckiana* may have been a species with limited distribution in "Virginia," as the region from which so many American plants were first taken to Europe was designated in the old herbals, and since then may have become extinct through the exploitation of the region by cultivation, or it may itself have originated by mutation from some other species in European gardens. Since that time, for over a hundred years, *O. Lamarckiana* has proved a constant type. And whatever may have been its origin, there can be no possible objection to its use as a subject for experimentation and one must express some surprise at the light way in which the results of these experiments carried on by De Vries and others have been cast aside as untrustworthy with the mere statement that *O. Lamarckiana* is only a garden variety or hybrid of some other form and that the new species are to be regarded as reversions to an ancestral type.

O. Lamarckiana is clearly differentiated from the other *Oenotheras*. The new species, too, are differentiated, not in one characteristic alone but in the assemblage of their characteristics.

Comparison of Old and New Species.

It is particularly fortunate that Professor De Vries was able to carry out his experiments with a plant belonging to a genus having several other species which may serve for comparison, otherwise the objection would be urged that the characters exhibited by the new forms were not of specific value. And several species of *Oenothera* have been well known for a great number of years and recognized as distinct by systematists, so that objection from

that source is silenced, for the new forms not only differ as sharply and in many points from each other as do the old accepted species, but the individuals of a given new species are always identical in their characteristics, whether originating from *O. Lamarckiana*, from one of the new species, from crossing or from the offspring of self-fertilized parents of the same species and show no transitions either to other species or to the parent form.

Parallel cultivation of the recognized older species and the newly originated forms offers the best and only thoroughly satisfactory method of comparing their characteristics. De Vries was able to compare *O. muricata*, *O. biennis*, *O. suaveolens*, with two or three subspecies, *O. hirsutissima*, (*O. biennis hirsutissima* Torrey & Gray), *O. parviflora*, *O. cruciata* and a few others, while for other species his studies were limited to descriptions, figures and herbarium specimens. The result of these comparisons as stated by De Vries is that the known systematic species of the subgenus *Onagra* in the main do not differ otherwise than the group of forms originating from *O. Lamarckiana*. The groups are analogous.

Transgressive Variability, Nutrition and Selection.

In these comparisons of the characteristics or the assemblage of characteristics of the new species we must not ignore one of the strongest pillars of support of the selection theory, transgressive variability. The existence of transgressive variability has long been recognized by systematists. One has only to examine a number of individuals of two or more closely related species to find that some individuals seem to represent in some of their organs, at least, transitions between the two species.

The nature of the support which the existence of transgressive variability has been supposed to lend to the selection theory is very apparent, but its significance has doubt-

less been much overestimated. In the first place such transgressive variability is usually in respect to a single characteristic, or, if to more than one characteristic, all are not transgressive in the same way or to the same degree. Species, however, are commonly not limited by a single character but by a complex of characters. On the other hand, cultural experiments have demonstrated for a limited number of cases that seed from plants with the intermediate value does not produce plants with the measured characteristics in the same degree as the parent but those showing a strong reversion to the type of the species to which they may belong.

These general conceptions have been applied by De Vries to *Oenothera*. Two of the old and accepted species of Linnæus himself, *O. biennis* and *O. muricata*, were used for the first comparison. These differ conspicuously in the size of the flower. Measurements were made of flowers gathered without conscious selection from *O. biennis* and *O. muricata* individuals growing in the same locality. The mean length of calyx and corolla lobes for *O. biennis* was found to be 19-20 mm., while that for *O. muricata* was 14-15 mm., confirming the general impression of the difference between the two species. But the length of the calyx lobes in *O. muricata* ranged from 8-18 mm., while those from *O. biennis* exhibited a wider fluctuation of 14-33 mm. Thus the two species furnish a beautiful instance of transgressive variability, and indeed it would be quite possible to collect a series of flowers which would connect the smallest- with the largest-flowered form in an unbroken series of fluctuations. Further illustrations need not be given; they may be collected in unlimited number by anyone who chooses to take the trouble. The limits of species are transgressed but not obliterated by this fluctuating variability, which is in large measure dependent upon conditions of nutrition.

This transgressive variability is found among the new species. They show fluctuations which may be transgressive, but this is no evidence against their constancy. It is the permanence of the type which determines this.

Since we have instituted comparisons between the fluctuating variability of the old recognized species of the systematist and the newly originated species of the experimental garden, an examination of some of the experimental work on fluctuations is pertinent in this place.

What are the causes of fluctuating variations always present? It would greatly simplify matters if we might assume that the causes are purely internal, but unfortunately for the convenience of the systematist we have reason to believe that such is not the case.

Let us examine into this problem in a little greater detail. De Vries has devoted a special section in his large work to "Nutrition and Selection" and here we may point out the conclusions of the experiments performed with a view to determining the causes of fluctuating variability in the *Oenotheras*.

The length of the fruit in *Oenothera* is a variable characteristic, and the fruit of *O. Lamarckiana* at Hilversum was found in 1893 to fluctuate between 15 and 34 mm., with a mode, or greatest frequency, of 24 mm. The fruit lengths in this species are closely correlated with the vigor of the whole plant as indicated by the thickness of the stem, the longest and thickest fruits being found on plants with the largest stems.

An extensive series of experiments showed that when the plants were grown upon especially manured soil the fruit length was very greatly increased and that in fact a greater increase in respect to this character could be secured by appropriate conditions of nutrition than by the most careful selection. When the smallest fruited, and consequently the weakest, plants were selected as seed

bearers and the culture given the finest possible conditions for growth, the range of variation—the difference between the minimum and the maximum—was increased. In all these cases the curves of variation remained practically symmetrical.

Variability in the fruit-length of *Oenothera*, then, is largely dependent upon nutrition, and while it occurs in accordance with Quetelet's law of variation which has been shown to apply to the fluctuations of the measurable characteristics of so many animal and plant forms, it is also capable of experimental control. An increase or decrease in the value of a characteristic may be secured by special conditions, but the permanence of the effect is dependent upon the presence of these special conditions.

The general significance of these considerations should be apparent. Here in treating of the new species of *Oenothera* it is only necessary to call attention to the fact that these experiments show that transgressive variability cannot form an argument against the distinctness of the new forms.

Conclusions from the Several Families.

We may now review the extensive sets of experiments in general terms and formulate the conclusions which they seem to justify.

New elementary species originate suddenly and without transition. This hypothesis has been advanced for garden varieties by various writers since the time of Darwin, but, as in almost all conclusions drawn from the field of practical horticulture, the data were open to serious question. But in the work of De Vries the conditions were quite different from those generally prevailing. The number of seed plants was relatively very small and they could be studied with the greatest care throughout their entire life history, so that there could be no doubt as to

their being typical *O. Lamarckiana*. Isolation of the plants during their first generations and their more certain protection in parchment bags with self-fertilization in the later generations made it certain that hybridization, unless in a very remote ancestor, had nothing to do with the results.

All of the hundreds of individuals belonging to the seven new species described above came from carefully studied and typical *O. Lamarckiana* ancestors, sometimes under observation for several generations. Their characteristics at a very early stage of the seedling and the classification of the young plants at that period led to no inconvenience when the individuals had assumed the more numerous and distinctive characteristics of maturity. In passing judgment upon some hundreds of plants, a few would be found of a doubtful position, especially such as had developed under conditions unfavorable to the normal development, but further growth showed these to belong undoubtedly to one of the groups into which the lot had been divided, or perhaps in rarer instances to represent a form now recognized for the first time.

Sometimes there were combinations of two sets of characters, as *O. lata nanella*, *O. scintillans elliptica*. Real transition forms between the new elementary forms or between these and the parent type did not occur.

That the new species are for the most part perfectly constant from the moment of their origin has been very strikingly demonstrated for several generations of various of the newly originated forms while not a single case of reversion to the parent type can be recorded. This showed itself true regardless of the number of individuals produced; for *O. gigas*, observed but three times, as well as for such frequently occurring forms as *O. albida*, *O. rubrinervis* and *O. nanella*. *O. lata* did not permit of a decision since it was always purely pistillate and could be propa-

gated only by crossing with some other species. The two forms which were found growing wild in the potato field, and which never again appeared in the culture, were as constant as the others when fertilized with their pollen, though *O. brevistylis* is almost sterile, producing a fruit with only occasional seeds.

The exception found in *O. scintillans* has been referred to already and its theoretical significance suggested. The evidence it offers is clearly very interesting but it does not speak strongly against the assertion of the constancy of the new forms. This constancy is a most important factor in the persistence of the newly originated species and a most striking and convincing illustration is that offered by the two new forms growing wild in the field at Hilversum. Here the struggle for existence is intense. The number of plants which may mature in its limited area is only a few thousands and the number of seeds supplied by a single individual would be almost sufficient for the area if all developed. But in spite of this, *O. brevistylis* and *O. laevifolia*, probably originating as did many of the new forms of the culture in at most only a few individuals, were able to hold their own for more than twelve years!

The third conclusion is that the most newly originated types represent exactly in their characteristics elementary species and not true varieties. To many people a variety is a form demonstrably originated from another. One of the most frequent objections to the theory of the origin of species by natural selection and one which has been most used has been that the origin of species has never been the subject of direct observation. As soon as a striking example was brought forward its rank as a species was immediately denied upon the ground that it was known to have originated from some other form and therefore could not be a species. It is evident that such quibbling should have no place in scientific literature. If a species

is a really definite unit it must be carefully limited and assigned its proper name wherever met and of whatever origin. In the general acceptance of the term varieties are distinguished by a single feature while species differ in almost all of their characteristics, in habit, as it may be called.

The most closely related elementary species differ in almost all their parts. To this the newly originated species of *Oenothera* form no exception. For this reason it has been impossible to give here a description of these forms. It has been said that to adequately describe and clearly differentiate the elementary species of a region would increase the size of the local floras five to tenfold. Often these differences are such as to show themselves only to the practised eye and then only in the plants as they grow in their native habitat, the characters of habit which there distinguish them so clearly being lost when specimens are taken for the herbarium. The new species of *Oenothera* show these numerous minor differences to a striking degree. Once carefully studied and described, there is no mistaking them at almost any period of their development, for these differences, though small, are sharp and distinctive. Nor do they depend upon mere habit of growth so that they are lost when material is prepared and preserved for future study and comparison in the herbarium. In this condition, when all plants lose many distinguishing characteristics, these new forms are still to be distinguished from each other and from the parent species with perfect ease; indeed with greater ease than *O. biennis* and *O. Lamarckiana*, two old and well established species of the systematist.

Only in *O. nanella* is there to be recognized a form which in accordance with general gardening terminology might be distinguished as a variety. It is also the only one for which comparable types may be found in the other

groups. Many species of the most widely separated systematic position have similar varieties in gardens. Red and white, proliferous and double, flowers, lacinate and smooth leaves, fasciated and twisted and pendulous, and smooth or unarmed stems are a few features which distinguish many constant garden forms as varieties rather than species, and everywhere in gardening literature one will see the Latin varietal names indicating these characteristics coupled with the most widely dissimilar species. The dwarf habit is one of these characters in point and a large number of garden plants with the varietal name *nana* or *nanella* are listed.

It is very interesting that this one form is the only one appearing in the Amsterdam garden which could legitimately be distinguished as a variety rather than a species. It was the hope of the experimenter that some real *varieties*, as for instance a white-flowered type, would appear in his beds, but this was never realized. While *O. nanella* may be considered a variety and in accordance with systematic usage be designated as *O. Lamarckiana nanella*, it must be remembered that so far as its behavior is concerned it is as good a species as the others. Indeed its constancy was subjected to even more severe test than the rest of the new forms. From an experimental point of view no sharp distinction is to be drawn between species and varieties.

The elementary species usually appear in a significant number of individuals at the same time or in the same general period of time. In the forms studied the number may be placed at 1 to 2 per cent. of the total number of individuals—an estimate which is rather too small than too large. This is a number which has been calculated sufficient to give a species well equipped for the struggle for existence a very good chance for establishing itself.

The new forms show no marked relation to individual

variability. *O. Lamarckiana* and all the newly originated forms show the usual fluctuating variability—the new forms sometimes in a greater degree than the parent—but there is no transition. The characters of the new forms are not dependent upon the differences attained by common variability. Cultured races may be secured by selection; they are not constant, however, but dependent upon selection for their perpetuity.

In the formation of new elementary species mutations occur without definite direction; the modifications embrace all organs and occur in almost every direction. The different organs may become larger or smaller, longer or shorter, broader or narrower, rougher or smoother, or the habit of growth may tend more to annual or more to biennial than that of the parent.

The question as to whether variations are haphazard or whether they occur in definite directions has not been without its polemic literature. The theory of Darwin and especially that of Wallace explained the origin of species by the selection of purposeless variations. The mutation theory explains the origin of the larger groups of forms, the Linnæan species, but not the elementary species, by the selection of the most fit elementary species. Just as according to the theory of natural selection, many individuals do not show the fortuitous variations which fit them exactly to their environmental conditions and are forced to the wall, so according to the theory of mutation only a few of the elementary species are adapted to meet the life to which plants are subjected and the most of them must perish.

The conditions observed in *Oenothera* under experiment offer most satisfactory evidence on this point, though the real fitness of the new forms can hardly be discussed until extensive experiments have been made. The two new forms found growing in the original locality were

able to hold their own for twelve years. Some of the new forms seem, in some respects at least, to be more vigorous than the parent type; others are so similar in vigor that no differences are to be distinguished, while many are evidently at a decided disadvantage in the weakness of their seedlings, their small size, their brittleness, their partial sterility or other characteristics. It was exceedingly difficult to bring some of the new forms to maturity, and these could certainly never persist in the keen competition in which plants must participate in nature.

The seventh and last conclusion must be drawn only very tentatively since, from the nature of the case, experimental evidence is difficult to obtain. That mutability appears periodically is indicated by the fact that the number of species found in a mutable condition is exceedingly small as compared with those in an immutable state. This may stand as a conclusion until further evidence may be obtained.

C. VARIETIES IN NATURE UNDER CULTIVATION.

The degree to which the selection theory is dependent upon evidence afforded by the improvement of domestic varieties can hardly be overestimated. This has furnished almost the sole experimental basis for the promulgation of a theory otherwise resting upon comparative data. For the scientific world the theory of descent might have been generally established upon the data derived from paleontology, comparative anatomy and embryology, but the theory of natural selection could hardly have won recognition without the support derived from the attainments of breeders.

We have already discussed the soundness of these inductions in support of the theory of natural selection and have pointed out that there are very serious objections to the use of the evidence from horticultural selection which

restrict or almost nullify its significance for theoretical considerations. The words selection and improvement of the gardener's vocabulary are terms too vague to have much significance when transferred to scientific parlance. To the man of merely practical purposes, they may mean the isolation of a single desirable and constant minor species, "race," or "subspecies," from its congeners, the finding and preservation of a "single variation," the freeing of a constant race from the effects of crossing with its neighbors, the isolation of a mutation which has exhibited its latent presence by some slight external deviation, or finally, the terms may convey the meaning which is attributed to them in the generally accepted form of the selection theory, the accumulation of fluctuations. So long as the problem was the formulation of the broad outlines of the theory of descent it was not necessary to look into this evidence more critically, but we have reached the stage in which this can no longer be neglected.

The beautiful observations of Professor De Vries upon the evening primrose have shown that species differentiated in the totality of their characters may originate immediately from others. To some it may seem that the evidence afforded is so complete and satisfactory that recourse need not be had to the evidence offered by garden varieties. But an examination of trustworthy observations reveals the fact that when investigated in a systematic way, and with the precautions which should be a condition of all scientific experiment, garden varieties yield data of the highest value.

What are varieties? This query has been answered no more satisfactorily than the great question of systematists, "What are species?" The affirmation that varieties are incipient species has not cleared away the difficulties of the systematist, and in the absence of any generally

accepted code each has used his own pleasure in designating the forms he described as species or varieties.

Linnæus seems to have recognized two kinds of varieties, and the practice of many of the best systematists lends weight to this conception. There are the numerous constant and well-defined minor forms or subspecies, "the elements of the species," as De Candolle termed them, and there are the derived forms. In the first case a number of types are grouped together for the sake of convenience but with the tacit understanding that all are of equal rank and that no one can be considered as derived from another; there is no *forma typica* from which others may be supposed to have originated by minor modifications.

The second class of varieties differs essentially from the first. While their origin is generally involved in as much obscurity as that of the minor species, there is strong comparative and physiological and even historical evidence that they are derived from a known specific form. Varieties of this class are generally distinguished by a single characteristic although others are not infrequently, perhaps generally, associated with it.

The first point of evidence for their derivative nature is the frequency of their occurrence in widely different genera and families. Smooth varieties of hairy species, thornless varieties of armed species, white forms of red and blue flowered species are known to every one at all familiar with plants. These we may designate as true varieties; they differ from the typical species only in the stronger or weaker development of some special character or in its entire disappearance.

Varieties present certain advantages for investigation. Only a few members of our flora seem to be in a mutable condition in which new species are produced; the birth of a variety is probably a more common occurrence. Furthermore, according to quite generally accepted rules, a variety

is distinguished by a single characteristic and their study is largely the investigation of the nature and conduct of individual characteristics.

The mutation theory is not merely concerned with the observation of the origin of species or varieties and with the demonstration that there is an unmediated rather than a gradual process; it attempts to go farther and analyze the characters of species and reduce them to the component units or elements. Differing from their species in only a single character, varieties offer most favorable material for the study of the individual units.

The Constancy of Varieties.

It is quite generally assumed that varieties differ from species in their inconstancy and it behooves us first of all to look into the evidence upon which such an assumption is based.

Many "varieties" are only the parts of a single individual found as a "sport" by some horticulturist and propagated by cuttings or some other vegetative method. Such forms are often inconstant from seed and are in no small degree responsible for impressions of the inconstant nature of garden varieties. A similar source of confusion is hybrids propagated in a vegetative manner. The many thousands of plants are perfectly constant so long as they are only parts of the same vegetative body divided and grown separately, but when propagation by seed is attempted the variety is lost. Gardeners know full well the importance of these vegetatively propagated hybrids and some of the greatest successes of Luther Burbank and others are of just this kind. Another source of confusion is the improved races which are merely the accumulation of fluctuations by selection and so soon as selection ceases the betterment is lost and the "variety" reverts to the species.

Such ameliorated races or vegetative varieties are

often not to be distinguished from true and constant varieties by inspection, and their designation by the same term necessarily results in confusion and strengthens the impression of the inconstancy of "varieties" as compared with "species." The same is true of partial variability. Parts of the same individual grown on mountains may differ so widely from the part cultivated in the lowland as to deceive all but the one who knows the whole history; the experimental morphologist in his laboratory may cause the different parts of a single plant to assume strikingly different forms by controlling the conditions of light and moisture, but while these experiments bring serious misgivings as to the validity of many of the species catalogued in the floras they do not establish the inconstancy of species.

Accidental crossing is one of the greatest sources of error. The experiments which have been made upon this point need not be given space here, but the danger from this source cannot be too strongly emphasized.

Pollen may be carried by insects or wind for long distances and except with the greatest precautions one can not be confident that the packet of seed which he collects from his plants for his next year's crop has not a few which contain blood of another sort. In the case of varieties the danger is still greater. In the crossing of species the hybrid usually has a form intermediate between that of the two parent species, but seeds produced by fertilizing a variety with pollen from its species or *vice versa* produce plants which cannot be distinguished from the species. The character of the variety is there in a latent condition and it will make its appearance later.

The establishment of so many sources of error in the evidence for the inconstancy of varieties suggests that after all these forms may be constant. We cannot attempt to discuss the numerous cultural experiments which have

been performed by De Vries, Hildebrand, Hoffmann, Hofmeister, and others to test the constancy of varieties. When crossing with other types was prevented constancy was found almost without exception. Among thousands of seedlings of varieties differing in the characteristics of their floral structure or color, in smoothness or hairiness, in the armature of stems or fruits, in the forms of their leaves or the habit of the stem, no reversions to the parent form have been found. These experiments, and their number and extent is very great, evidence most forcibly against the assumed instability of these minor forms.

One of the most important proofs of the constancy of spontaneous or garden varieties is the great age of some of them. New forms are introduced every year, but it must be remembered that they are produced in a great number of ways and that their designation as varieties is merely a matter of convenience not always to be justified on scientific grounds. Many varieties were known to the Greeks and Romans, and when we come down to the more modern times of the herbals of the sixteenth and seventeenth centuries we find excellent illustrations of some which we have to-day.

The Origin of Garden Varieties.

If, then, garden varieties are constant, what has been the mode of their origin? The evidence derived from the experiments with the evening primrose leads us to consider it most probable that their appearance has been by mutation, by sudden steps or bounds, and not by a gradual process of selection.

Historical records upon these questions are not very satisfactory, but a searching examination of such as exist tends to emphasize the probability of a sudden origin of the constant garden forms.

The instructive history of *Chelidonium majus lacinia-*

tum has already been mentioned. First observed in an apothecary garden in 1590 and never found in a wild state, it is to be assumed that this cut-leaved variety originated by mutation from the ordinary form and that it has been constant to this day. Of cut-leaved varieties among trees a long list might be given. Laciniated alders seems to have been produced by mutation at sundry times and cut-leaved maples are said to be produced quite frequently from seed of normal trees.

For many horticultural purposes, "weeping" varieties of trees are prized and a number of species have these varieties. They seem to have originated suddenly in single or at least very few individuals.

The smooth-fruited variety of the thorn-apple, *Datura*, originated suddenly and is of particular interest from the fact that it furnished the data for one of the earliest and clearest statements of the idea of mutation. Other cases of the origin of thornless varieties by mutation are well authenticated or highly probable.

The dwarf variety of *Tagetes signata* originated in a single individual among others of the normal form in Vilmorin's nursery in 1860. The dwarf *Oenothera*, *O. nanella*, may be recalled here and several other cases of the sudden appearance of constant dwarf varieties might be mentioned.

The remarkable origin of the cactus dahlia has already been described, and numerous other cases might be given were space available. As already stated, the accumulated evidence indicates for garden varieties a sudden rather than a gradual origin and justifies citing them as evidence in favor of the mutation theory. Sterile varieties are not easily explained on the ground of the selection theory, but they lend themselves most readily to the support of the mutation theory. Korschinsky has done a most important work in examining carefully into the history of garden

varieties for the purpose of determining the mode of origin of the various forms. His review is most comprehensive, covering the most diverse characteristics of stem and leaf and flower, and he concludes that the origin of new constant types has been by unmediated steps, by what we now term mutation, and not by the accumulation of fluctuations.

The history of some of these cases is most interesting, but these very general statements must suffice for the comparative data while we pass to the consideration of two sets of detailed and laborious experiments. The first is the origin of the "double" variety of the corn-flower and the second peloric form of the toad-flax.

Origin of the Double Corn-Flower.

Of all garden varieties perhaps the most common are the so-called double or filled flowers. Roses, hollyhocks, carnations and larkspurs are at once called to mind and the preparation of a complete list would be a serious task. This doubling usually consists in the transformation of stamens, and sometimes carpels as well, into petaloid structures.

Among composite plants, the sunflowers, daisies, marigolds, zinnias and others, we also meet with double varieties. Here the flowers are an aggregation of small flowers or florets. Of these, the outer row are frequently provided with large, conspicuous, strap-shaped or ligulate corollas and are designated as the ray flowers, while the others in the center of the disk have a short, tubular corolla, usually of relatively inconspicuous color as compared with the showy peripheral ones, and are known as disk or tubular flowers. Occasionally only tubular or "disk" flowers are present, as in *Eupatorium* and thistles, and again only ligulate flowers, as in the dandelion. Many forms originally with both disk and ray flowers have become "double"

by the transformation of the tubular corollas of many of the disk flowers into the ligulate corollas characteristic of the periphery. The most familiar examples of this are the *Chrysanthemum*, *Zinnia* and *Dahlia*.

With the hope of observing the production of a flower of this type from the normal form, De Vries cast about for a suitable species upon which to work, and finally chose the corn-marigold, *Chrysanthemum segetum*, which has a much prized garden variety *grandiflorum*.

Upon counting the ray flowers of the terminal heads of the plants grown from the seed which he secured from botanical gardens, indications of a mixture of the varieties were seen. The number of ray florets in the *Compositæ* is variable. This variability follows the law of Quetelet, and this variety *grandiflorum* is distinguished by the possession of twenty-one ray flowers whereas the species has thirteen; around these numbers the fluctuations occur, the typical form sometimes bearing more than twenty-one rays and the *grandiflorum* type sometimes as few as thirteen.

The mixture was easily sorted into two constituent varieties by the selection of plants with thirteen- and twenty-one-rayed flowers. This process, however, requires much time since thirteen and twenty-one are only the typical worths around which the plants vary, and it is quite possible that a plant which is spared may be a widely fluctuating individual of the other type.

After three years' selection of twelve- and thirteen-rayed plants over 150 individuals were counted and found to have an average of exactly thirteen rays in the terminal head. The following year the same figures were obtained, so it was evident that the pure thirteen-rayed type had been isolated. The *grandiflorum* type was now isolated in the same way, the rays of the terminal heads of over

1500 plants being counted in the last year of the process of isolation.

In 1896 De Vries selected 500 plants from the 1500 with terminal heads with twenty-one rays and about the middle of August counted the rays of all the heads of the secondary branches as well. Among the many thousands of heads examined, all but two had twenty-one rays or less. This single exceptional plant was isolated and the heads allowed to be fertilized by pollen carried by insects from some others of the best plants of the group.

This slight deviation of structure in the secondary branches of this individual seemed indicative of some more profound change, for the number of rays could now be increased rapidly by selection. The progress was by veritable leaps. In the first year the average came up from 21 to 34, and then to 48 and 66 in the two succeeding generations.

These changes, however important, do not represent the real object of the experiment, which was to observe, if possible, the real origin of a double from a single form,—that is to say, a form in which some of the tubular flowers of the disk were transformed into ligulate or strap-shaped flowers similar to the rays.

Finally, in the fall of 1899, the fourth year of the selected race, the desired anomaly made its appearance in a single individual in which a few rays were found in the disks of three of the younger heads on one plant.

Two years' work eliminated the effect of crossing with other individuals and the double variety was quite as perfect as the other cultivated types of the same kind.

Origin of Peloric Toad-Flax.

By peloria we understand the assumption of an actinomorphic or regular form by a normally zygomorphic or irregular flower. Presumably the prototypes of these ir-

regular flowers were themselves regular so that in a certain sense the assumption of the radially symmetrical form may be regarded as a reversion to a more primitive type.

This anomaly is described for a large number of forms, especially the two-lipped Labiatæ, Scrophulariaceæ and Gesneriaceæ. A discussion of the structure and manner of occurrence of these forms would be of great interest, but here we must limit ourselves to the most condensed treatment possible.

A gradual origin of such a deviation as peloria is not easily imagined. The phenomenon is seen very rarely or not at all in some genera or families while in others it may be observed with great frequency. Indeed examples of peloric races are not unknown. Seeds from such a one may be obtained for the foxglove and snap-dragon, *Digitalis* and *Antirrhinum*, which repeat the anomaly with great regularity though not always in all flowers or individuals. Another very constant example is the *Gloxinia* of our greenhouses. These showy plants have an erect, splendidly colored regular corolla while that of the prototype was more or less pendent and irregular.

Usually only a few of the flowers of any one plant are peloric, but in the toad-flax, *Linaria vulgaris*, all the flowers of a plant sometimes show this peculiarity. The corolla of *Linaria* is normally two-lipped and one-spurred, but in the peloric forms the two-lipped character disappears and the number of spurs is increased to five.

De Vries chose this species for experimentation because there was evidence that the wholly peloric variety had originated from the normal type with only occasionally a peloric flower in a number of instances and in widely separated localities. This renders it probable that it may appear again and under carefully controlled conditions of ancestry and environment. The object of the culture

was only to observe again what has presumably occurred in nature at various times.

The first recorded discovery of peloric toad-flax seems to be that of a student of Linnæus, whose find was described in 1744. Since that time it has been discovered in many places and under circumstances which render it most probable that it originated upon the spot from the normal type. In some cases the variety seems to have flourished for a time only to disappear later. The assumption of an independent origin of the peloric variety in each locality is supported by the fact that it is very difficult of fertilization by insects and ripe capsules with seeds have never been seen in nature, a fact which discredits at once the assumption of a possible common origin of the collections from the many widely separated localities.

In 1886 De Vries began a series of pedigree cultures of *Linaria* in the hope of being able to observe the origin of the peloric form. Roots of normal plants with one or two peloric flowers were transferred from a locality near Hilversum to his garden and flowered the following summer, producing seed for the second generation which was grown during the three following years. The plants flowered profusely, bearing in 1889 only one and in 1890 only two peloric flowers. Seed from the flowers of 1889 served for the continuation of the race, the third generation in 1890-91, which produced thousands of normal flowers but only a single five-spurred flower, which was pollinated by hand and produced ample seed for the culture of 1892. By sowing in the greenhouse and suitable methods of culture it was found possible to raise this and subsequent generations as annuals. Again only a single peloric flower was observed. The plant bearing this and one other individual were selected as seed parents—the toad-flax being quite sterile with its own pollen—and yielded an abundance of seed.

From this seed about fifty plants flowered in the autumn of 1894. Among these several peloric flowers were observed, eleven plants showing either one or two or even three of these abnormal flowers, but this cannot be regarded as remarkable since such individuals may occur in varying, though usually small, numbers in each generation. A single plant, however, was observed to produce only peloric flowers; the following year it bloomed again and confirmed the conclusions of the first year; the flowers were peloric without exception. Here, then, in a plant whose ancestry was definitely known to be of normal type for four generations, we have the first experimental mutation of a normal into a peloric race occurring suddenly and without transitions, only a single peloric flower having been found in the careful daily scrutiny of the thousands of flowers produced by the parents during two summers.

The ten cc. of seed from which the sowing for the fifty plants had been made was now nearly all sown and some 1750 flowering plants secured among which 16 wholly peloric individuals were found. The mutation occurs, therefore, in about 1 per cent. of the individuals. The possibility of crossing with the mutated individuals was excluded and the experiment continued. In subsequent generations the mutation was again repeated but with cultures limited in extent. In one case, however, two and in another one mutated individuals were obtained. These were related as "nieces" to those described above and appeared in the same manner, suddenly, completely formed and unaccompanied by transition to the normal form.

The external features of a plant must not serve as an ultimate criterion for the determination of its place in the system of classification. So far as may be seen by the eye alone it is often impossible to distinguish between an inconstant ameliorated race, a hybrid or an extreme

variation propagated by vegetative means, and a true species or variety. The true criterion of systematic worth is constancy in heredity and this is the test which must be applied to all mutations.

In the case of the toad-flax under consideration this is extremely difficult owing to the almost total sterility of the race cultivated. From over 1000 flowers carefully pollinated not a single normal fruit was secured but a rudimentary capsule yielded seed for 119 flowering plants of which about 90 per cent. were true to their type. Whether the ten per cent. reversion was due to atavism or only to accidental crossing cannot be determined.

Summarizing these remarks on peloric forms we find that peloria, the assumption of a more or less regular form by a normally irregular flower, is not infrequently observed in nature, and in some families with much greater frequency than in others. In some cases it seems to be in a high degree heritable so that we may perhaps speak of peloric races. In other cases the phenomenon does not appear in every generation, but the latent potency which we may assume to be at the base of it becomes only occasionally active and we have what we may term iterative mutation. In the case of the toad-flax, De Vries has observed the origin by mutation of a perfectly formed peloric variety, *Linaria vulgaris peloria*.

D. CONCLUDING REMARKS.

The conclusion which impresses itself upon the mind of the reader as he lays aside the first volume of Professor De Vries's work is that the origin of species has, in a few cases at least, become a matter of direct observation. This important process is no longer beyond the limit of actual observation and supported by only comparative data.

This is the point upon which the author himself lays the greatest emphasis and to a discussion of the method

of experimental evolution he devotes considerable space. For our present treatment it will be well to pass over these more special considerations and mention briefly the general conclusions derived from a comparison of the theories of selection and mutation.

No two individuals of a planting are exactly alike, expresses the variability—flowing, fluctuating, individual, statistical or whatever else it may be termed—of all living things. The selection theory postulates that these individual variations may be accumulated and fixed by selection. The mutation theory regards them as of no significance for the origin of species. Garden or local races may be developed or improved or acclimatization secured, but the limits of specific identity are not transgressed. The modifications accumulated by selection are not unlimited in extent and do not become independent of selection for their perpetuity. In sharp contrast to this betterment of forms by selection is the origin of new types. These appear suddenly, without transition from the parent type, and are constant from the first.

The statement that species have originated through natural selection in the struggle for existence requires some explanation before it may be embodied in the mutation theory. When the struggle for existence, or better the competition for existence, occurs between individuals of the same species, those least fitted to meet their life-conditions are forced to the wall and improved races or acclimatization results. This falls within the field of common variability. The competition may also occur between individuals of different species and then the *species* best adapted to the environment persists. But the struggle for existence and the survival of the fittest has nothing to do with the origin of the fittest. Before they may come into competition species as individuals must exist, and it is with special *species-forming* variability that the muta-

tion theory is concerned. The "survival of the fittest" has, then, two distinct meanings, the survival of the fittest individuals and the consequent development of local races or the securing of acclimatization in the constant specific type and the essentially different survival of the fittest species.

According to the mutation theory species have originated not by slow selection continued for hundreds or thousands of years, but by steps, through sudden though often very small transformations. Variations occur in plus or minus directions while mutations occur irregularly in all directions. Variations are of constant occurrence but mutations appear only from time to time.

The theoretical importance of the results of this long and laborious series of experiments carried out by Professor De Vries can hardly be overestimated. It is difficult for contemporaries to evaluate justly the interpretations which a naturalist assigns to the facts he has discovered and compiled. Many refuse to accept De Vries' positive iteration of the essential difference between fluctuating variability and mutation and the impossibility of accumulating the former by selection to the amount of fixed specific differences, but the results of the observations can hardly be discredited, and those who are acquainted with the literature of botany see everywhere series of other facts which seem to become clear and significant in the light of De Vries' discoveries and interpretations. It is not desired that these pages be a contribution to the too voluminous polemic literature of evolution, but that they shall furnish an epitome of the attempts and achievements of those who have been convinced of the discontinuity of variation with the consequent discontinuity of specific characters. It need only be remarked further that the researches of De Vries and others have built up a system of data which is impregnable to all but similar or improved

experimental methods. These investigations have raised the study of evolution from the morass of polemics, and in connection with the rediscovery and investigation of the Mendelian principles have given us the hope of the attainment of a real and definite knowledge of the organization of species.

Whatever be the present view of the generalizations which have been drawn, no one can deny the value of the method. Professor De Vries himself says: "Hauptsache ist, dass die Culturen im Garten uns verrathen, was in der freien Natur stattfindet, was sich dort aber der Beobachtung entzieht."

But while insisting on the fundamental value of the method, we must not lose sight of the intrinsic value of the materials assembled by De Vries in support of his theory. "The greatest contribution since that of Darwin," is the estimate of even those who are conservative in accepting the generalizations which De Vries has formulated. It is not given to one man to elaborate and promulgate alone an epoch-making doctrine, and several writers have perceived the importance of many of the conceptions which find their place in the comprehensive theory as it is now elaborated; but it is the fundamental importance of the results of long years of patient and successful experimentation which has won for Hugo De Vries the first place among those who have contributed to the renaissance of evolutionary studies.

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FRANCE.

THREE RECENT WORKS ON CHRISTIAN THOUGHT AND CATHOLICISM.*

I DESIRE to include in one group three works,¹ the subjects of which are closely related and supplement each other. These

¹ Paris: Librairie F. Alcan.

are *La Pensée chrétienne* (from the Gospels to the *Imitation of Christ*) by Joseph Fabre; *Histoire générale et comparée des philosophies médiévales* by François Picavet; and *L'Evolution de la foi catholique* by Marcel Hébert.

M. Fabre's work consists of six parts. The first two, "Jewish Eclecticism," and "Alexandrian Eclecticism" give a synopsis of the philosophies which prepared or inspired Christianity. The third and fourth books, "Primitive Christianity" and "Catholic Dogmatism," show the origin, the formation (and also the deformation) of dogmas, sacraments, and rites up to the point where we find them in the Catholicism of to-day—a very interesting part of the volume. The fifth book, "The Scholastics," explains the beginning of the mediæval schools. The sixth, "The Mystics," presents contemplative spirits side by side with dialecticians; the ecclesiastical and dogmatic religion as opposed to religion of sentiment, which may be considered a religion active or passive according to the evangelical current whence it proceeds.

Though M. Fabre's fine volume contains no less than 656 pages.

* Translated by Amélie Sérafon.

the exposition is brief. It would not have been possible at one attempt to exhaust so vast a subject and the author has intended rather to give a summary review of Christian thought, from its commencement to the end of the theological era. Though he has proved himself fully qualified for the task, it will be advisable to supplement his work, either with M. Marcel Hébert's critique of Catholic dogmatism or M. Picavet's history and interpretation of mediæval philosophy.

* * *

M. Picavet's work of 367 pages(very fine print) is indeed a monument. So broad and so exact is his scholarship, and so clear his method of exposition, that this work will remain an indispensable guide, not only for the study of the schools in the Middle Ages, but also for the entire history of those times.

In this work he has undertaken to compare the history of philosophy with all forms of the history of civilization and to make a still deeper comparison between philosophies and doctrines in relation to each other, especially of those philosophies and theologies in the Middle Ages which had a common inspiration, and never ceased to exert an influence upon one another. It is interesting to read in his first chapter the details of his plan for study which he himself applies in the present work as far as possible, though this is only the outline of an extensive history that he means to write.—This sketch, however, as I have said before, is already a work of the first rank.

Let us show at once the results obtained, without stopping to expound the method. The most important of these results has been the consideration, at last, of the mediæval philosophies in their completeness, and the exact definition of their common characteristics, their origins and tributaries. Henceforth it will no longer be possible to reduce them to what was formerly called scholasticism, that is to say to a "philosophy that was Christian, Catholic, orthodox, more or less confused with Thomism, and closely allied to peripatetic logic." Still less would it be possible to limit them to the

question of "universals," a question, let us add, whose range and significance have been demonstrated in modern debates on evolutionary theories. It seems, on the contrary, that these philosophies form "a collection of theological philosophies, which are connected with Hellenic and Roman religions, with Judaism, Mohammedanism, and Christianity." All, or nearly all, give way to antique systems and to acquisitions of positive science in their own time.

The Aristotle who became one of the masters of the Middle Ages, M. Picavet affirms, was not the intellectual Aristotle, the logician and disciple of Plato; nor even the Aristotle of whose writings St. Thomas furnished a commentary from authentic texts; but it was an Aristotle who was the bearer of doctrines associated with his philosophy by successive generations of speculators; an Aristotle deformed at the hands of Stoics and Epicureans (and above all of the Alexandrians) who handed over his philosophy thus disfigured to the Arabs, Byzantines, and Jews, by whom it was again transmitted, imbued with mystical and religious characteristics, to the mediæval philosophers from the eighth to the eleventh centuries. Moreover—and this fact is of no small importance—the thought of the Middle Ages is not connected directly either with Aristotle or Plato, nor with St. Paul, nor with the Hellenic Jew, Philo. The first and truest inspiration came from Plotinus.

M. Picavet establishes with forcible proofs that all syntheses first attempted between scientific, theological, and philosophical elements can be traced to Plotinus, and also those undertaken later by the Christians, Mussulmans, Oriental and Occidental Jews. This fact helps to explain why the principal trait of mediæval philosophies was, above all, reflection on the subject of religion and various aids to faith. Speculations about God and the soul, and the means of becoming united to divine perfection predominated; so that the thought of the mystics no longer appeared as an exception to the abstract and logical manner of thinking of schools, but rather as one of the purest manifestations of that religious spirit which is in some degree to be found everywhere.

Plotinus's system (which, M. Picavet says, far surpasses the

medieval philosophies it inspired) is founded on the acceptance of an *intelligible* world regulated by the principle of perfection, and a *perceptible* world the study of which really means the study of science. In addition to the positive systematization of perceptible facts, a metaphysics and a theology assert themselves; a dialectic of *feelings* is added to a dialectic of *ideas*. Thus the essential work of the medieval period was to establish an intelligible world which might be the explanation, the model, the aim of the perceptible world. Herein lies the difference between new and primitive religions. Even Brahmanism and Buddhism have not cared to unite allegorical interpretation and positive knowledge by reason and experience, and take away images from reality without introducing scientific notions.

"Grecian polytheism since the beginning of the Christian era, Judaism after Philo, Greek and Latin Christianity, Protestant and Reformed communities which have arisen since the sixteenth century, the religious doctrines of the Oriental Mussulmans up to the eleventh century, and of the Occidental Mussulmans to the thirteenth, thus appear with common characteristics of sufficient importance to make it possible to extract one religious philosophy from them all, the constitution of which should be of incontestable value for the history of religions."

In consequence of these very facts a correction is made necessary in regard to the distribution of historical epochs. If Plotinus developed Christian thought according to the Hellenic spirit, it was only under the direct action of that thought itself. So we can no longer place the origin of medieval civilization in the eighth century: it really began in the first century of the Christian era. The period included between the eighth and the thirteenth centuries is not the first, but the second period of scholastic philosophy. At that time Gerbert familiarized the Western world with Arabian philosophy, and the great masters of thought succeeded each other without interruption to the date of Philippe Auguste's university. St. Thomas Aquinas stands at the highest point; he remains "the great rationalist of Christian theology."

M. Hannequin² reproaches M. Picavet with seeing perpetrators of the scholastics in the metaphysicians of the seventeenth century, in Descartes and even in the scholars and psychologists of the present period, without observing that the universal familiarity with mathematics has changed the point of view. This reproach seems unjustified to me. Certain problems are not necessarily done away with because their text has been modified, and the continuity of effort consists in different processes of solution. But I do not wish to engage in this debate; scarcely have I been able to give an adequate idea of the riches of this volume, the mere index to which constitutes a real compendium.³

* * *

M. Marcel Hébert (formerly l'abbé Hébert) has undertaken the task of investigating the formation of Catholic faith and the problem of the survival of Catholic organization. He wishes to take neither the attitude of revolt nor that of submission. Revolt, he says, is unjust and passionate. Submission exposes to unconquerable difficulties whoever does not freely accept the authority of the Church as supernatural, and the "transcendancy" of Catholicism: it is impossible to see anything else in l'abbé Loisy's submission, for instance, but an "opportunistic disciplinary solution," a "provisional transaction."

It can not be disputed that a certain sentimental disposition, a peculiar attitude of heart and mind has led men at all times to create religions. The fact is incontestable, and only the historical consequences are of any importance to us here, without defining exactly or criticising more closely the different situations or significations which we can give to the term "religious feeling." We shall see a little further on how M. Marcel Hébert himself defines it.

Why religious feeling has expressed itself in the form of theology; how this transformation occurred and how we have passed from individual faith to ecclesiastical faith; how the Council of the

² *Revue Philosophique*, April, 1905.

³ To curious readers interested in the Catholic movement I would especially suggest the chapter before the last "La Restauration Thomiste au XIXe siècle."

Vatican regulated the question of faith and condemned "fideism": these are the principal questions round which the development and discussions of his work are grouped.

The law that every sentiment has a tendency to explain and express itself, is sufficient to account for the fact that religions have originated. The transition from religious feeling, image, and myth, interpreted by sentiment alone,—the transition from image to theory by a more or less philosophical interpretation, and then the systematization of theories—in this progression (as far as relates to Christianity) lies the scheme of theological evolution. There is no trace of this transformation to be found in the Bible, except in St. John's Gospel. In this, Jewish intelligence gives way to Grecian intelligence; the notion of the *logos* is purely Greek.

The different meanings of the word "faith" correspond to the growth of theology.—Faith in the Old and New Testaments means trustfulness; in the Epistle to the Hebrews, certitude of the invisible; in St. Paul and the Fourth Gospel, it is an element of mystical union. In the Pastoral Epistles a new meaning appears: the direct intercourse between God and the soul gives way to the relation between "the faithful" and ecclesiastical authority. The crystallization of beliefs is beginning to operate. Thenceforth the more personal, the more intimate side of faith is called "piety"; and the meaning "intellectual belief," or "orthodox belief" becomes more and more the only actual meaning of the word "faith." Reasons for this are not wanting. First, the longing of the distressed soul for an intangible and stable dogma, entrusted to an infallible authority, and "such dogmas, such an authority must as a matter of course have arisen in that enthusiastic Christian atmosphere where lack of a critical spirit was always the general rule and where simplicity of mind was held to be a virtue." Next, the heresies and ravings of the Gnostics in which the moral efficacy of Christianity vanished, determined the formation of monarchical episcopacy and orthodoxy.

Here arise two orders of facts or questions which mingle in an historical account—but which ought to be distinguished from one another in order to make things clear. One is the question in regard

to evidences of faith and their intrinsic value (miracles and prophecies, beauty of Christian life, testimony of the soul, etc., etc.); the other, the formation of the doctrine of the Church, concerning the respective action in faith of the three factors: reason, will, and grace. I will extract from M. Hébert's instructive book only what seems to me most likely to throw light on the present situation of Catholicism.

The Reformation was a reaction in favor of personal faith—of confiding faith (see in Chap. VII the debate between Claude and Bossuet), its doctrines are nevertheless peculiarly narrow. "Jansenius," writes M. Hébert, "took up again, in a moderated form, the exaggerations of the Reformers; according to them, original sin has caused not only the decadence, as orthodox doctrine affirms, but the absolute ruin of reason and liberty. Of his own accord and without the grace of God, man can only fall into error and evil. It is to the credit of the Catholic Church that it has rejected doctrines apparently so favorable to its interests, and has stood up for the rights of human nature."

According to the teachings of the Church, faith may be defined as an assent of sovereign certainty which intelligence, by order of will influenced by the grace of God, gives to truth because it is a revelation from God. Thus is determined the relation to each other of the three terms or factors, reason, will, and grace. This relation will nevertheless suffer serious perversions in new or renewed attempts at explanation, conciliation, and vindication ("fideism" with its many forms, symbolism, etc.) which the Council of the Vatican (1869-70) would condemn either on the ground that they do not conform to the doctrine of the Church, or that they threaten to ruin the very basis of its institution.

Rome condemns l'abbé Bautain, Father Ventura, and others (M. Hébert calls them "moderate" Traditionalists, Bonald and Lamennais representing the Traditionalist school) proceeding from the principle that the use of reason precedes the act of faith and leads to faith with the help of revelation and grace. Rome condemns, too, the systems of M. Hermès, of Gunther, etc., which, though they admit supernatural revelation, claim that reason should have the

power to demonstrate the truth of the dogmas, in justifying and explaining their contents. And the Church after all "was right not to permit man to limit himself to one of his faculties"; she has tried to keep the middle course between "the pure intellectualism of a Hermès or a Gunther, and the pure sentimentalism of a Schleiermacher." Against "fideism" she accepts and defends intelligence; "she does not consent to be satisfied with a *practical truth* or a *symbolic value* instead of dogmas; she has claimed and still claims for them a *theoretical truth* and an *objective value*."

But how is it possible to prevent reason from taking more than is granted it? M. Hébert shows us Catholic dogma held tightly between the two jaws of a vise, philosophical thought and historical criticism. He does not think its essence will issue from it purer and more active. The conception of symbolism of the dogmas, as represented by Auguste Sabatier in the Protestant Church and Alfred Loisy in the Catholic Church, appears to him illusory. They saw in these dogmas only constructions of faith, of creative imagination symbolizing our feelings and aspirations, which Rome could not accept without destroying itself. The Church claims for itself a supernatural authority, but not in the philosophical sense (super-sensible). The Catholic notion of the supernatural is that of a perfection, an energy, a gift, bestowed by God, that no finite being could acquire by his own strength. The Church believes in a supernatural which is essentially distinct from the natural; it does not submit to be reduced to the level of a simple providential institution. The symbolistic interpretation, therefore, (symbolistic Catholicism, liberal Protestantism, liberal Judaism) is an expedient, not a solution.

Loisy's works represent, according to M. Hébert, the historical form of the present movement, which he calls the "renaissance of fideism." Blondel represents its philosophical form, Brunetière its social form. To Brunetière Hébert raises the objection that the craving for belief does not imply the constitution of an authority to determine the belief; Brunetière brings forth anew the theory of the "moderate traditionalists." Far greater he judges the importance

of Blondel and Loisy. Blondel, moreover, attempts in vain to pass from the human natural to the Christian supernatural; and Loisy, to realize "free faith in free history." Their "fideism" only saves the right of a religious consciousness to assert itself by myths in which it might express and incarnate itself.

Ecclesiastical authority "is wrecked by the historical investigation of miracles, particularly of the resurrection and of the transmission of Divine powers from Christ to the Church."

And now the author of this remarkable work concludes, "it is because humanity had embodied the highest aspirations of conscience in Christian dogmas, that these myths affected it more by a deep moral suggestiveness than by the force of their literal meaning—since criticism demonstrates their worthlessness." "The great progress achieved in our days," he continues, "is that religious feeling itself is no longer confused with the monotheistic myth in which it was formerly embodied." This deep sentiment cannot be wrecked.—But henceforth there can be no religious act except the conscious adhesion to that ideal order of things to which science, art, and morality tend." "It is precisely in so much as we feel in science, art, and morality, the knowledge and progressive realization of that ideal order, that we find a religion there. That impulse is religious, and that alone, by which we act as organs of that wonderful creation of a better order of things."

* * *

Besides the special interest of the subjects treated, the three works I mention, written by men who have not the slightest resemblance to each other, will impress the readers of *The Monist* pretty accurately as to what the attitude is in France towards Catholicism, the attitude of thinkers entirely freed from Church authority, but holding in regard to the religious interests of societies, lofty and correct ideas, far removed, in this, from the unwholesome passions, which too easily predominate in our political assemblies.

Although indifference in religious matters is of common occurrence among us, all religious activity is far from being extinct. Both Catholics and Protestants possess important reviews and jour-

nals; numerous works are produced by the pen of Churchmen and sincere believers. A singular fact might perhaps be mentioned, that in some Catholics faith in dogmas vanishes without their zeal for the religion of their fathers being in the least diminished. Besides these publications I could name several practical associations for propaganda, the *Sillon* (furrow) for instance, founded by M. Marc Sangnier. And the open hostility of our newly elected rulers has not been able to impede the movement; on the contrary, it has taken greater force. The separation of Church from State might diminish the apparent power of the Church, but it would increase its real vigor and might at least determine the formation of a Catholic party which would be energetic and of considerable numbers.

Freedom of thought is a fine condition. But how few men deserve the title of free thinkers! How few are capable of thinking, or really ever think for themselves! The ruin of present religious associations (if it could be brought about) would leave room for associations of another sort, and the same individuals would soon give themselves up to other disciplines. There will always be, in the human flock, many sheep to one bellwether. But is it really so great an evil? Is it not rather one of the essential conditions of social life? True statesmen and philosophers cannot ignore these simple truths, which escape the blurred vision of partisans. Vainly these latter imagine, after the fashion of children, that they are deceiving time by changing the hands of the watch and flatter themselves that they can complete history within the course of their own short existence.

I approve, too, the position of our eminent Editor Dr. Paul Carus in making a few prudent reservations concerning M. Yves Guyot's letter published in the June number of *The Open Court*. I would myself like to offer several observations on certain points in that letter, but they would lead me too far from the particular object of our correspondence, and as it is, I owe an apology for adding a long page to an already extensive analysis.

PARIS, FRANCE.

LUCIEN ARRÉAT.

CRITICISMS AND DISCUSSIONS.

THE PROBLEM OF TIME.

PHYSICS VS. METAPHYSICS.

The great St. Augustine, Bishop of Hippo, in Africa, writer and theologian, the celebrated French prelate and writer, Fénelon, and Kant, greatest of German metaphysicians, all believed that time is stationary; that it does not, with relation to the transitoriness of matter, begin, pass, and end with relation to events. Respectively, in Latin, French, and German, they bequeath to us their lucubrations on the subject, St. Augustine at one time so puzzled and distraught about the mystery, as he deemed it, that he besought heaven for enlightenment.

But let us take a simple case, as illustrative of the point to be established in the course of the demonstration here intended, that, on the contrary, time is not stationary, that it passes with the transitoriness of other things.

For the convenience of round numbers, let us imagine a locomotive in motion, aboard the train of which a passenger is speeding away for a mile, at the rate of sixty miles an hour, a mile a minute, exactly eighty-eight feet a second. Let the locomotive's whistle blow a continuous blast during the minute passed while the mile is traveled. The passenger perceives the sound to be of the same pitch throughout the whole distance. But let him, on the contrary, stand beside the railway while a locomotive rushes by under the same conditions of speed and sound. He no longer perceives the pitch of the whistle to be the same throughout the course of the mile. He hears its pitch, when the whistle is near him, as a shriek or yell, but as it continues to sound, with the rapidly departing train, he hears it successively as a roar, a groan, and a moan. Then, with distance, comes silence.

The pitch of every note, natural or artificial, depending upon the greater or smaller numbers of vibrations acting on the drum of the ear, the greater the number of vibrations produced by a resonant body is, the higher the pitch of the resultant note; the smaller the number, the lower the pitch. The highest pitch perceptible by the human ear is of 38,000 vibrations, the lowest, only 16. The listener standing near the locomotive, under the circumstances described, hears, as has been mentioned, the same note, first as a shriek or yell, then as a roar and a moan, its natural pitch affected by time and distance, lowering it in effect, to the listener's ear until silenced by distance. This happens because, as the whistle rapidly increases its distance from the listener, the vibrations are spread out, so to speak, through the effect of lapsing time over increasing distance. The velocity of sound, unlike that of light, which is instantaneous for all but celestial distances, requiring considerable time to reach a given point (a second,—temperature 60.8° Fahrenheit,—for every 1115.4 + feet), and the whistle's rate of departure from the listener at the railway's side being eighty-eight feet per second, only a portion of the normal vibrations per second of its pitch reach his ear, and these, in consequence, represent lower notes.

This is the fact, open to the observation of the least acute observer, and such as it has often been scientifically described. Being the fact, it completely disproves the theory that time is stationary, and that only matter and events, as the general condition of other phenomena, are fleeting. Assume, however, for the sake of argument, that time is stationary, and we shall clearly perceive, by comparing a consequence of that theory with the conclusion just reached, how ill it stands the test.

Time, then, we will concede, for the sake of argument, is stationary. If it be so, then, as before, the passenger aboard of the supposititious railway train going one mile a minute, eighty-eight feet a second, while its locomotive blows a continuous blast from its whistle, hears the true pitch of the whistle from the beginning to the end of the prescribed mile. This, therefore, occurs as it occurred before, under the condition that the listener is aboard the train. This test, therefore, does not conflict with the theory that time is stationary. Whether time be stationary or moving, the listener must, under these circumstances, hear the whistle at its true pitch, for he is accompanying it with the same effectiveness of hearing its true pitch as though he should stand by the railway's side at the moment when the blowing whistle passes.

But, mark, upon the theory that time is stationary, he would also hear, throughout the whole course of the mile, the true pitch of the whistle, even if he should stand at the railway's side. For, by the theory that time is stationary, there could be no lapses to his ear in the whistle's vibrations. Time being stationary, as the theory requires, the vibrations would reach him with the full number due to the whistle's normal pitch. The theory implies that time is indivisible, and therefore, that sonorous vibrations cannot be affected in transmission by the circumstance that their source is being whirled away through space, requiring, as science says, lapse of time, but, as the theory says, none. According to the theory, there is no relation of time to motion, and incidentally, to sound; for, if time be stationary, it cannot relate by action to any of its contents in the coexisting universe. That, as shown, it does not, according to the theory, harmonize with one of its contents; that it is, with relation to it, purely negative, is proof that it is not stationary. If time be stationary, the train passes through it without other relation to it than passage, which makes time's relation to it negative; but if time be moving, it accompanies the train, and its relations to any train's passage, or other motion of matter, whether relatively to it or to human observation of it, may be infinite. In the particular case before us, the relation, upon the hypothesis that time is moving, is fixed in various of these relations, notwithstanding that it is supposed to be moving, but, upon the hypothesis that time is stationary, there can be no correspondence between it and any movement in space.

So much may be said concretely, for the most part, in the case presented. It may, however, prove interesting to add the following word of pure generalization.

If time were, according to the theory, a something steadfast, through which all other things pass, instead of being a something which passes with them, it must be, as has been already mentioned, something indivisible. If it is not resolvable into units divisible by the arbitrary units of distance employed by humankind, their measurements of the relations of time, distance, and motion are merely imaginary. If time be stationary, it must be absolutely incapable of resolution into parts, just as the infinitude of space is similarly unresolvable. If time were stationary, it would be the only thing in nature unchangeable, of all that the human mind perceives of created things. It is, however, only under the condition of imagining the universe to be destroyed, that time is justly conceivable as

also ceasing to exist; but certainly, if existing, not as ceasing to move. Kant, however, explicitly denies the proposition that time would cease with the abolition of matter and space. But it seems preposterous not to regard time as an integral portion of the universe, vanishing with matter and space.

We must not imagine, from the ease with which this case is disposed of, that the distinguished men cited, who held to be true the theory that time is stationary, were not men of mind. They had little opportunity to obtain knowledge of acoustics and of other branches of science, of which even schoolboys have nowadays a smattering. There was, in their times, ancient down to modern, no Helmholtz, with his brilliant discoveries and teachings about fundamental notes and overtones and sound generally. There were no locomotives, clanging by with furious whistling, whose departing sound would doubtless have led them to the discovery of what is so plain to us of longer experience. They were as earnest in the search of truth as are any men of this era. One cannot but sympathize with St. Augustine when, yearning to solve the question regarding time, he burst forth into prayer as he wrote on the theme: "My mind burns to understand this most mysterious enigma. I do not desire to conceal, O Lord, good Father, in the name of Christ I beseech, I do not desire to conceal my longing. . . ."

Thus St. Augustine, in his ardor, interrupts from place to place in his works his discussion of the question as to time, reaching the conclusion that it is stationary.

Fénélon, in a most eloquent disquisition on the subject, reaches the same conclusion with St. Augustine. Kant is as diffuse on the subject as they, his summary being that the world generally receives the false impression of the movement of time from witnessing the decay of things. The Spanish theologian and metaphysician, Balmes, remarks, in a note to his work, *Fundamental Philosophy*, that long before the Scholastics, the doctrine of the immovability of time had been taught by the most eminent authors, that Plato was not ignorant of this truth, that the Fathers of the Christian Church taught it, the Scholastics adopting the definition of Boëthius: That eternity is "An interminable and simultaneously perfect possession of life."

But, really, this definition conforms with an idea of time, whether regarded as a moving or as a stationary phenomenon. Eternity in the existence of anything, or of everything, is conceivable, and moreover, is actually conceived, as existence with

mutability save as to the soul. If science, through observation and experiment, recognizes, as it does, the indestructibility of matter and of energy in the universe, it may well hold as true the idea of time as moving, while recognizing, through observation, constancy in its course. Motion, in a word, not quietude, is the law of the universe, so far as observation and reason have detected and enabled mankind to judge of creation.

What vitiates the conclusion of St. Augustine, Fénelon, Balmes, and others regarding time is the concentration of their attention, not upon the pure and simple question as to whether or not time moves, but upon the maintenance of the eternal existence of God, which is not at all involved in the question. Consequent upon their conviction of this thesis, to the exclusion of everything else, they deem its corollary to be, that time is never past nor future, but always present; which is, of course, tantamount to believing that it does not move. The course by which they reach this conclusion from the postulate, that God is eternal, is the consideration that, were time moving, it would involve the consequence of admitting the possibility of the beginning and end of creation and creator. Therefore time, they conclude, must be ever present time. St. Augustine exclaims, speaking of eternity, "There, nothing is past, as if it no longer may be; nothing is future, as if it may yet be." Fénelon, in turn, exclaims, "But what does not pass, exists absolutely, and has but an infinite present." Fénelon, in the course of his long discourse on the subject of time exclaims, addressing God, "I always err whenever I depart from the present when speaking of you" [sic]. The fact is, that both St. Augustine and Fénelon wrote on the subject of time in religious ecstasy, which, in St. Augustine's case, takes the form of frequent recurrence to prayer, and in Fénelon's, that of a rhapsody throughout his treatise on the existence of God.

Father Buffier, on the contrary, treats the subject with what Balmes regards as levity. "It seems to me," says Father Buffier, "that these notions are as clear as they can be, and he who seeks to make them still clearer, is about as little intelligent as he who would like to make clear how twice two are four, and not five."

Haeckel, who professes himself a Pantheist, says, "Since Kant explained space and time to be merely forms of perception,—space the form of external; time, of internal sensitivity,—there has been a keen controversy, which still continues, over this important problem. A large section of modern metaphysicians have persuaded

themselves that this 'critical fact' possesses a great importance as the starting point of 'a purely idealist theory of knowledge,' and that, consequently, the natural opinion of the ordinary healthy mind as to the *reality* of time and space is swept aside. This narrow and ultra idealist conception of time and space has become a prolific source of error. It overlooks the fact that Kant only touched one side of the problem, the *subjective* side, in that theory, and recognized the equal validity of the *objective* side. 'Time and space,' he said, 'have empirical reality, but transcendental ideality.'

How can Haeckel say that Kant touched only one side, when his own quotation from Kant defines both sides, and Kant says much more on the subject?

Although Kant does recognize time as known to common experience, he denies the *passage* of time when he tells us that we know it only through our perception of the decay of things. By both stating and implying that time stands still, he, of course, admits that time is real, but regards it only as a subjective reality, a form of human consciousness. Balmes, in his *Fundamental Philosophy*, remarks that Kant "asserts, without reason, that time in the things is nothing, and that it is only the form of our internal sense." As for Haeckel, he does not refer, in the quotation just made from his work on *The Riddle of the Universe* to the question as to whether or not time moves, but merely as to that of its empirical existence.

The fairest course to pursue is to select from Kant himself, among the numerous passages which he devotes to the subject, one that is conclusive as to his view. He says, "Our doctrine asserts, then, the *empirical reality* of time; that is, its objective validity in regard to all objects which may, on any occasion, be offered to our senses. And as our perception is at all times one of senses, there never can be given us an object in experience which is not submitted to the condition of time. But, again, we deny time all claim to *absolute reality*, if regarded as intrinsic condition inherent in things-in-themselves, irrespective of the form of our sensuous perception. Such attributes as belong to things-in-themselves can never be made known to us by the senses. In this, then, consists the *transcendental ideality* of time; which abstraction being made from the subjective conditions of sensuous perception, is absolutely nothing: and cannot be attributed to objects-in-themselves (or apart from their relation to our perception), whether as subsistent or inherent."

Further on, Kant answers objections made to this theory by persons who are not metaphysicians; but this passage from his

pen, in *The Critique of Pure Reason*, defining his view of time, will suffice for citation. It means, in sum, that time is a *phenomenon*, the appearance of an existence, and therefore, empirical; but that, of the corresponding *noumenon*, the thing-in-itself, we can have no knowledge.

But how is it consistent in Kant to deny, in one place, time as having any "absolute reality," to declare it an abstraction of sensuous perception, to be, in fact, "nothing," and yet, in another place, previously noted here, to regard it as the survival of a hypothetical abolition of matter and space? A *noumenon*, or thing-in-itself, is, in metaphysics, predicated of every *phenomenon*, or thing as it seems to be. But here Kant, in violation of metaphysical principles, defines the nature of the *noumenon*. He defines it too, as "nothing." How, then, if it be "nothing," would it endure as time, were matter and space to vanish? How, metaphysically, can a phenomenon have any existence without a corresponding *noumenon*? Can a *noumenon*, moreover, on those terms, be "nothing"?

To English readers such a discussion as the preceding might seem singularly incomplete, if it should ignore Locke, so I conclude with a brief statement of his view regarding time. He remarks: "There is another sort of distance, or length, the idea whereof we get, not from the permanent parts of space, but from the fleeting and perpetually perishing parts of succession. This we call *duration*, the simple modes whereof are any different lengths of it whereof we have distinct ideas, as *hours, days, years, etc., time and eternity.*"

This expression makes it clear that Locke regarded time as moving, but, if more be needed, Locke's meaning is confirmed by Alexander Campbell Fraser, the editor of *An Essay Concerning the Human Understanding*, who, in a side-note to the passage quoted, prints, "Duration is fleeting extension."

The bounds mentally prescribed to this article have been reached. One might, with reason, had its dimensions been contemplated as broader, enter Hume and Leibnitz in the lists as contestants with regard to the essence of time, and going further, find a volume too small to include a history of the interminable war of ideas as to time, let alone those related to the questions of matter and space. Here, therefore, the limit has been reached which is practicable in a magazine for such a subject as that which has been here presented.

It seems to me, in summing up, that consideration of the previous discussion, coupled with due reflection upon the glimpse of creation

there afforded to sight, must bring conviction that time is not only real, but that it moves in profound compatibility with eternal motion in matter, from the myriad electrons streaming within the dancing atoms of agitated molecules, to suns so distant that they are far beyond even photographic vision of the earth. If an additional thought be permissible here, the question may be asked whether it is not credible that, as matter and energy, so far as we know them, are recognized as immortal, one may not rationally suppose that mind may survive. It may be answered, as if conclusively, that all energy, so far as we know it, is interchangeable in character, that nothing has been more conclusively proved than its constant *mutability* throughout the action of the correlation and conservation of energy. True, but the saving clause herein lies in the fact embodied in the words, "so far as we know," and justly. too, for discoveries in this department of knowledge have not ceased to the present day. It is conceived by many as probable, and by many more as certain, that there is a form of energy, not inextricably correlated to its generally recognized forms, variously termed mind or soul, through which, if so, the existence of Deity as its highest type is implied. Certain it is, that if one chooses to regard nature as wholly materialistic, a distinctly greater difficulty would seem to be thereby admitted by the question as to the possibility of its producing through evolution what is universally recognized as mind.

RICHARD MEADE BACHE.

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MATHEMATICAL ANALOGY.

An article by Mr. McFarland in *The Monist* of October of last year, calls attention to a fruitful source of error in the reasoning of many people, who have picked up a knowledge of mathematics at second-hand, and think they can apply it to reasoning about the question of miracles or about moral problems. The whole mass of misleading speculation on this subject rests on two initial false assumptions.

1. There does indeed exist a connection between religious and mathematical doctrine; but the parallelism is not, as many suppose, between facts in the history of Palestine and curves drawn in Europe or America; but between two psychologic conditions. Any attitude

of mind or sequence of mental operations which, if a man were trying to trace a curve, would lead him into error and make him mistake the false for the true, is, *a fortiori*, likely to lead him into some error if he is trying to trace out the relative values and get the resultant of a mass of complicated evidence about something long ago. Therefore, a sound mathematician tests the value of his reasoning about miracles, by asking himself whether a parallel line of reasoning would make him "prove" something not true if applied to the simpler problem of tracing a curve.

2. But there is a far more serious caution which should be given. The process by which a person, who is not himself an original discoverer in mathematics, arrives at understanding, or thinking he understands, a demonstration at second-hand, is absolutely different from any process by which an original mathematician makes a discovery. Now, when a real mathematician speaks of applying his mathematical method to religious or moral questions, he means the method by which he originally arrived at the mathematical truth, the method by which he got his own mind into a condition to receive new mathematical truths as an inspiration. No real mathematician would think of applying a demonstrative method, such as that criticised by Mr. McFarland about the curve, to any question connected with religion, morals, or miracles. That a great many pseudo-mathematicians do make the attempt is a sufficient reason for being very grateful to Mr. McFarland for exposing its absurdity.

An experiment is now being tried in England, of giving children a few years of steady initiation into the methods used by the great original mathematicians for training themselves for sound inspiration, before the children are allowed to be shown the logical demonstration of any geometric proposition whatsoever. The results are rather remarkable, and are attracting a good deal of attention. An account of the method of training will probably be published in the course of this winter. It is believed to be as nearly as possible the same as was used in very ancient times in Egypt and India for training the privileged or priestly caste.

M. E. BOOLE.

LONDON, ENGLAND.

THE MOSAIC LAW AND THE CODE HAMMURABI.

To the Editor of The Monist:

In the April number of *The Monist*, 1905, page 200, my Hammurabi theory is alleged to maintain that both the codes of Palestine (viz. the Mosaic law) and Babylon have been derived through "a regular development of certain principles of primitive Semitic social life."

This is a mistake, and obviously Dr. Godbey, the author of the mooted article, confuses what I say concerning the *Urgesetz* and the *Ursemitisch*. By the latter is meant primitive Semitic life; by the former, which I have also called "archetype," I understand (as careful reading of my book will show) a definite Babylonian law antedating Hammurabi.

Accordingly, the objections made by Dr. Godbey are irrelevant, for it was my very purpose to prove that

1. A close connection exists between the Mosaic law and the Code Hammurabi;
2. The Mosaic law has not been derived from the Code Hammurabi; and
3. Both have been derived from an "archetype," i. e., a more ancient Babylonian law.

PROFESSOR D. H. MÜLLER.

VIENNA, AUSTRIA.

IN THE BEGINNING.

"In the beginning God created the heaven and the earth." Thus opens Genesis, with a statement that has since remained a problem. The general interpretation of it is that the universe, as we know it, came into being at some fixed period in eternity. To this science has added the conception that it has since gone through a long process of evolution, is now running down like a clock whose spring is weakening, and is destined to lose its vitality at some fixed future period.

Such is the dictum of Scripture and of science. Can we accept it? It must be said that the mind of man revolts against it, rendering the involuntary verdict that time had no beginning and can have no end. Before "the beginning" what? is an inevitable question. After "the end" what? is as inevitably asked. Did God exist from eternity alone and call matter into being from absolute nothingness? Will God exist through a later eternity

alone, in company with the dark and dead spheres of the universe? Man's reason enters a strong protest against any such dogma. From the dawn of civilization we hear this protest, in the doctrine of the old Brahmanic philosophers, who maintained that matter and spirit are co-eternal and one in essence, that a self-conscious Deity infiltrates and controls matter, and that the conscious spirit of man is but an atom temporarily set aside from the infinite consciousness of the Deity, into which it is destined to return.

So far inspiration and philosophy take us. But in modern times many have ceased to put faith in either inspiration or philosophy, accepting facts only, and taking refuge in the cave of the Agnostic from those vast problems which sweep beyond the reach of human thought. This is, perhaps, a somewhat barren attitude. In the absence of facts bearing upon these questions it is difficult—impossible, it may be—to escape from speculative dreams and problematical theories, and science is as great a sinner in this direction as theology. But in regard to the problem of “the beginning” we may justly ask, what do facts teach? Is there anything known to man that will aid in its solution? Yes, let us answer. There are facts of astronomy known at the present day which seem quite out of consonance with the old doctrine, and teach us that, instead of one definite beginning, there have been countless beginnings in the evolution of the universe, some dating back myriads of years, some of comparatively recent origin, some still in the throes of birth, some whose germs alone as yet exist. And if so with the beginning, it may be so with the ending. The end of spherul evolution may have been reached in many instances. In others it is still myriads of years in the future. As to whether each of these endings will prove the germinal point in a new beginning is a matter far beyond our ken.

As for the facts bearing upon the case, they are numerous and significant. When we look upward upon the vast array of suns which stud by millions the nightly skies, what do we behold? Not a multitude of spheres of the same apparent age, as we might expect under the prevailing hypothesis, but an innumerable series of solar orbs of every age and stage of growth. As we look downward on our own race, we perceive the new-born infant, the child, the youth, the mature man, the man of middle age, the old in whom the seeds of death are sown, and finally the lifeless corpse. As we look upward into the star-studded heavens we behold something strikingly analogous. Spheres lie there in every stage of growth, from early infancy to decrepid age, if such a parallel is admissible. The host of stars that stud the skies may well seem to our uninstructed eyes of the same age and condition. But the telescope tells a different tale, and the revelations of spectrum analysis have taught us remarkable lessons about those distant spheres. As regards the light-giving suns, those which, like our own solar orb, are probably the

ruling centers of families of planets, there are evidently very great differences in age. Father Secchi, the noted priest-astronomer, forty years ago divided them, on the basis of their spectra, into four types: (1) The white stars, like Sirius and Vega, held to be young and intensely hot; (2) The yellow stars, like Aldebaran and our own Sun, of mature age and diminishing heat; (3) The red stars, with spectra presenting fluted bars, fainter towards the violet end,—in these old age is fast coming on; (4) The faint, deep-red stars, with wider fluted bars and spectra fading towards the red end,—the light of these is supposed to be near extinction. Secchi's views, a revelation when made public in 1865, have since been generally accepted by astronomers, who now hold that the light-giving stars of the heavens differ immensely in age, some being millions, perhaps billions, of years older than others. It is true that certain changes have been suggested in Secchi's types. Type 3, for instance, is placed by Lockyer at the beginning of the series. But the general fact involved in them is undoubted by astronomers.

Yet this is only a starting-point. Since Secchi's time astronomy has made many steps of advance. We now see far before and after. The youngest sun known to us is already far advanced in its life career. We are familiar with much younger forms. The oldest light-giver has a long course yet to run, veterans being known of far greater age. We are aware of the existence of dark suns, orbs that have long lost their light and sunk into blind old age. We are similarly aware of the existence of embryo suns, in many stages of development. The story of the stars spreads before us in remarkable completeness, and we see the tenants of the heavens in every stage of existence, from infancy to dotage.

Let us begin with the stage of solar childhood. Nebulæ, the germinal stuff of stars, are now known in great numbers. Thousands of them exist, of all sizes and many shapes. They are visible in the telescope from the vague wisp of nebulous matter to the sphere whose recent origin is shown by the faint nebulous cloud still clinging around it. Between these extremes are varied phases of development, which are classed as annular, elliptic, spiral, and planetary nebulæ and nebulous stars. The tendency to assume the spiral form is strongly marked among them, and we see this in what seem various stages of condensation. The planetary nebulæ show faint disks, as of solar orbs gradually forming out of the original fire mist. The nebulous stars are the final stage of star birth, in which a trace of the nebula remains, the condensation not being quite complete. Such is, very briefly told, the story of star generation, so far as we are familiar with it. The details of this story, as now known to astronomers, give excellent warrant for the general belief that the nebula is the mother form of the star and that in its varied forms we have set out before us the genesis of the suns.

Passing now to the later stages of the process of solar evolution, we move onward through the various types of stellar progress to the faint and fading dark-red sphere, and thence to the dark star, the burnt-out sun, the solar globe whose light was extinguished long ages ago. How many of these exist in the skies we do not and can not know. That we know of their existence at all is a remarkable example of the magic of science. That astronomers should have been able to discover orbs of darkness in the heavens, trillions of miles distant from us, seems incredible, yet they are to-day quite as convinced of the existence of these lightless stars as of our sun itself. Their discovery forms an interesting chapter in modern science. We must speak of it with great brevity, yet perhaps can make its method evident in a few words.

The peculiar variations in the motions of the bright stars Sirius and Procyon gave rise, more than half a century ago, to the theory that these changes, periodical in character, were due to the presence of dark companions. It was held that Sirius, for instance, was accompanied by a dark orb—a planet, let us say, of monstrous size,—and that the two revolved round each other. Sirius alone could be seen, but the strange fluctuations in its motions seemed to point to a sister orb near by, by which it was pulled out of place. This theory was received at first with much incredulity. Fortunately, in 1862, by the use of a new and powerful telescope, the companion star was discovered. It was not quite dark, it yielded light enough to reveal itself, though its brilliance was ten magnitudes less than that of Sirius. In mass Sirius was twice the larger, a fact discoverable by the strength of their mutual attractions. By great good fortune the dark companion of Procyon was similarly found, at a later date. In 1896, when the powerful lens of the Lick Observatory was turned upon this star, its companion became visible, a light-giver indeed, but twelve magnitudes in visibility below Procyon.

These discoveries, we have said, were fortunate. They demonstrated the truth of the theory in these two instances and thus gave warrant for its application in many other similar instances, where the dark companion continued obstinately invisible. There are many variable stars, several hundreds of them being now known, in which the light fluctuates at fixed intervals, declining in intensity for a period of greater or less length, then regaining its full strength. An explanation of this is that a dark companion revolves around the visible star, cutting off part of its light when passing between it and our eyes. Periodical fluctuations in the motion of these stars go to show that this explanation is the correct one. The bright star Algol, for instance, is known to have such a dark companion, which at once affects its motion and its light. It does not cut off all the light, and therefore seems to be of smaller size, but its influence on the motions of Algol proves it to

have twice the mass of the latter, and in consequence to be much more dense and compact. It may be said further that most of the variable stars—but not all—have spectra of the fourth type, showing that their light is approaching extinction.

As in the cases of Sirius and Procyon, all of these dark companion stars may be light-givers to some extent, but rarely sufficiently so to be detected by the telescopic power at our command. There is another matter here calling for comment. The companions seem of very different age. There are two possible explanations of this. Either their constitution differs, so that one has lost its light-giving powers more rapidly than the other, or they were originally separate tenants of the skies, and became companions as a result of approach and mutual attraction.

We have no means of discovering the existence of dark stars except those given, and can never hope to detect them unless they are companions of light-givers. Thus our powers in this direction are restricted to a very small percentage of the whole multitude of stars, and though we may with some justice conjecture that there are myriads of independent stars of this character, we cannot demonstrate this. Yet we have a reason for believing in it other than the known existence of many dark stars. This is the fact that the visible stars show successive stages of development, from the brilliant white globe to the dark red orb whose light seems fading out. It seems safe to conclude that this process continues till the stage of invisibility is reached, and we may even conjecture that it goes on in many cases till the star has lost its heat as well as its light and has reached the end of its career as a vital tenant of the skies.

To return now to the title of this paper, "In the Beginning," we are justified in asking: When was that beginning? Have not the actual beginnings been countless in number, as many as there are independent stars in the skies? The heavens seem to tell the story of multitudinous beginnings and endings, births dating back to almost infinite periods in the past and births now taking place before our eyes; while between them lies every stage of development from infancy to old age and death. The "beginning" taught by Scripture can apply to our solar system only, the sun and his family of planetary bodies. It evidently has no application to the universe as a whole.

Such appears to be the inevitable conclusion so far as our knowledge of facts leads us onward. Yet we may have some justification in taking one step into the kingdom of speculation. Two chapters are missing from our volume, the one that precedes the faintly visible nebula, the one that follows the traceable dark star. In the one case we are in the presence of an early stage of life; in the other in that of a stage far advanced towards death. What went before and what comes after? Is it not possible that the beginning

and the end may shade together and death be the herald of a new life? May not the dead sun, through some process of disaggregation of which we know and can know nothing, break up into its primal elements, dissolve to form a new nebula, and thus return to the stage of "The beginning," ready to set out again on a new career of evolution?

This is conjectural; no one can say that it is impossible; for, in spite of the theory of the irreversible dissipation of energy, we remain blankly ignorant of the forces of aggregation and disaggregation which may exist in the universe, and are incapable of placing a limit to its possibilities of change. If, for the sake of the argument, it be granted that such a reversal in the action of forces may be possible, it opens to us a wonderful vista into the process of creation and eternity. In a universe in which the old starts out again, by a natural evolution, as the new, there could be no beginning and no end. Every sphere would run its separate course for myriads of years, and then give birth to a new sphere, again to run a course of vast duration, and eternity would be a process of births and deaths unceasing, with all the wondrous panorama of spherul life stretched out between.

This view may be looked upon by many as heterodox, and as out of consonance with the dogmas of orthodox science. But the facts stand before us, and the strictest orthodoxy cannot set them aside. The universe is not a realm of one beginning and one ending, but may have had almost as many beginnings as there are separate stars, many of the tenants of space being myriads of ages older than others. Whence do the new nebulae come unless there is material provided for them? And whence does this material arise? Is it matter newly created for the purpose or old matter transformed and fitted to run its evolutionary race again? Modern science is very unlikely to accept the former view, but if it accepts the latter we are led to the inevitable conclusion that the processes of the universe are continual, not transitory, and that spherul evolution may well be a process eternal in duration,—without beginning and without end.

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BOOK REVIEWS AND NOTES.

DER SKEPTIZISMUS IN DER PHILOSOPHIE. Erster Band. Von *Raoul Richter*, Privatdozent an der Universität Leipzig. Leipsic: Dürr. 1904. Pp. xxiv, 364. Price, 6 marks.

The purpose of this book is to find the narrow path to truth by investigating those philosophies which claim either a total or a partial scepticism as the only possible solution of the philosophical problem. The present volume contains an historical exposition of the ancient Greek Skepsis, especially Pyrrhonism, and the Academic Skepsis. The second volume which has not yet appeared, will attack the more important problems of modern partial scepticism and will also be devoted to an investigation of the immanent scepticism which is contained in the transcendent dogmatism of a Pascal and other mystics as well as the transcendent scepticism of Kant.

We hope to find opportunity of saying more of the first volume when the second appears.

ERKENNTNIS UND IRRTHUM. Skizzen zur Psychologie der Forschung. Von *E. Mach*, Emer. Professor an der Universität Wien. Leipsic: J. A. Barth. 1905. Pages, 461.

Erkenntnis und Irrthum is a collection of lectures and essays on the psychology and logic of science. Part of them were delivered as lectures at the University of Vienna in the winter of 1895-1896. Three of the essays, viz., those on "Psychological and Metrical Space," on the "Psychology and Natural Development of Geometry," and on "Space and Geometry from the Point of View of Natural Inquiry," are reprinted from *The Monist* of 1902-1903, for which they were especially written. These essays, which constitute perhaps the most original part of Professor Mach's new work, will be published in English in book form this spring, by The Open Court Publishing Co.

We hope to publish a more detailed review of Professor Mach's views on "The Origin and Nature of Science" in a later number of *The Monist*. The titles of the essays of the present volume have a familiar sound to all readers of Professor Mach's former publications. We append a few: "The Concept," "Adaptation of Thoughts to Facts," "Experimenting in Thought," "Hypotheses," "Number and Measure," "Space from a Physical Point of View," "Meaning and Value of Natural Laws."

Like all of Professor Mach's writings, the present work contains a host

of brilliant and suggestive contributions to the philosophy of science. He has placed many of his old points of view in an entirely new light, and has put into connected and systematic form much material which until now has lain scattered and inaccessible in his more fugitive writings. The essays are marked by the same calmness, simplicity, and moderateness of expression, which have become an unflinching and distinguishing characteristic of all of Professor Mach's writings.

POPULÄRE SCHRIFTEN. By Dr. Ludwig Boltzmann. Leipsic: Barth. 1905. Pp. 440. Price, 8 marks. Bound, 9 marks.

Professor Boltzmann, the leading physicist of Germany, and successor to Professor Ernst Mach at the University of Vienna, offers in this volume a collection of lectures and essays which have appeared during the last decade. The constituents are very irregular, partly scientific and partly mere *causeries*. He discusses Maxwell's theory of electricity, the mechanical theory of heat, the significance of theory in general; and other problems within the domain of mathematics, mechanics and physics. He criticises his rival Ostwald and devotes several lectures to such great men as Kirchhoff, Joseph Loschmidt, etc. He devotes a scathing criticism to Schopenhauer, scorns philosophy in contrast to exact science, defends the mechanism of atomistic principles, not as absolute but as indispensable, and finally winds up with a report of his journey to America. He had been invited to lecture at the University of California, and he does not hesitate to give us the impression which he had during his hasty trip to the Pacific Ocean. His account is sometimes very humorous, although the humor may not always be intentional, for he tells us of his sufferings from heat and thirst and dust, and conditions to which he is not accustomed.

Dr. Hans Kleinpeter, an admirer and one of the most prominent disciples of Professor Ernst Mach, offers an exposition of Mach's conception of science and the world in his article "On the Monism of Professor Mach," which appears in the present number of *The Monist*. We count ourselves among the admirers and personal friends of Professor Mach, but we would say that in some salient points we do not endorse Dr. Kleinpeter's view. Though Professor Mach has worked out his views independently of other thinkers and though his method of dealing with facts may be rightly regarded as original, we do not accede to Dr. Kleinpeter's opinion that Mach's philosophy is as unique as he represents it. As to our own opinion we have to say that there are differences, and whether or not they are to be considered important depends very much upon the view which Professor Mach would take of them himself. We feel inclined to enter into details and make a resumé of the points of agreement and apparent discrepancies, but we abstain from it in the present number, reserving the subject for a future issue in case it would be deemed welcome to our readers.

ERRATUM.

Our attention has been called to an important typographical error in the department of "Criticisms and Discussions" in the January *Monist*. In Mr. Peirce's contribution to "Mr. Peterson's Proposed Discussion," on page 149, line 25, the last word should read "definitive" instead of "definite."